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CONCEPT OF OPERATIONS AND IMPLEMENTATION PLAN FOR INDUSTRY INTEGRATED LOGISTICS SYSTEM (I²LS)

Lt Col James A. Boyd, USAFR

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A new approach to the logistics of acquisition combines elements of military and corporate strategies, which would allow the Department of Defense to take links out of the supply chain and radically streamline the system. The result will be a dramatic decrease in both logistics response time and materiel cost.

Shortly after the bombing of Pearl Harbor, the Japanese captured Hong Kong, French Indochina, Malaya, Burma, Thailand, and the Dutch East Indies. During the early stages of World War II in the Pacific, Japan systematically took control of islands throughout the region. Their reach extended to New Guinea and the Solomon Islands to the south, and two islands in the Aleutian chain to the north. For the Allies to conquer the Japanese, it would be necessary to either invade Japan or force the Japanese to surrender. The Japanese, however, were well protected by over 3,000 miles of ocean containing hundreds of fortified atolls. To maintain their foothold, the Japanese had developed a serpentine logistics chain stretching across the Pacific, that

moved supplies systematically from one island to the next.

General Douglas MacArthur, as Supreme Allied Commander, realized that it was not necessary to take back every island along the route leading to Japan. Instead he employed a "leapfrog" strategy, where he simply bypassed strongly held islands in favor of weaker ones further up the logistics chain. Once the stronger islands were cut off from their source of supply, the occupying Japanese soldiers were forced to retreat.

Much like the Japanese World War II logistics system in World War II, the process for our logistics system is a serpentine chain of warehouses and transportation channels linking our manufacturers to our fighting forces. As supplies move

through this chain, each point along the way adds time and costs. This system was the same one used in the private sector to move consumer goods from manufacturers to the public. In the late 1960s, Sam Walton of Wal-Mart stores realized that by cutting links out of the chain (and allowing goods to "leapfrog" from the manufacturer directly to his stores), he could save both delivery time and product cost. The concept presented here details how the Department of Defense (DoD) can take links out of the supply chain to radically streamline its logistics system. The result will be a dramatic decrease in both logistics response time and materiel cost.

CONCEPT BACKGROUND

While commander of the Defense Contract Management Command (DCMC) at the Stewart and Stevenson plant in Sealy, TX, LTC Paul Dronka recognized a need for a modernized parts system to support the Army's new family of medium tactical vehicles (MTVs). Dronka initiated an Army Reserve project to study modern systems used in private industry and to develop a new system to be considered for MTV parts support. I was tasked for this project, and was sent to study manufacturing operations at Lockheed's Fort Worth F-16 Fighter airplane plant and at

Bell Helicopter's facility in Dallas. After Dronka's reassignment in July 1997, his replacement, LTC August Mancuso III, embraced the project and lent additional years of experience as an infantryman, tactical logistician, and contracting officer.

The resulting concept incorporates state-of-the-art methods into a distribution system based upon "best commercial practices" rather than the traditional "demand-level based" military supply system. The discussion below shows how the new system can operate.

THE CONTRACTOR-MANAGED PARTS PROCESS

This distribution system constitutes a paradigm shift from the traditional depot parts support process. Whereas the depots depend upon warehousing and stockage based on demand levels, the new process (the contractor-managed parts process) relies upon best commercial practices. Here I'll provide an overview of the new concept; the details will be presented in a Concept of Operations at a later date.

BACKGROUND

The DCMC Stewart and Stevenson-Sealy has contract administration responsibilities for the Army's new-generation family of medium tactical vehicles (FMTV). The DCMC recognized a need

James A. Boyd, an Air Force Reserve lieutenant colonel, is a manager for the Directorate of Aerospace Fuels Management, Kelly Air Force Base, TX. He holds B.S. and M.S. degrees. He is an Air Force logistics career program manager. His logistics experience obtaining vehicle parts as a vehicle maintenance officer at Elison Air Force Base, AK, was critical in writing this article.

for follow-on parts support, and the proposed process was to consider current practices and best commercial practices, as well as "state-of-the-art" systems under development. The DCMC funded a 1-week reserve active duty tour to Lockheed in Fort Worth, TX, and to Bell Helicopter in Dallas, TX. Many of the ideas came from those facilities, but the proposed concept is a unique approach to methods currently used by the DoD.

PROCESS

The unit material management activity (MMA) identifies a part or assembly needed and places a "fill or kill" requisition into the military supply system. If the request cannot be filled by the MMA (containing emergency essential and fast moving items), the MMA then calls customer support centers (CSC) of applicable contract parts depots (a number of contractors could be involved). If the item is to be deployed to a theater of operations, the request is directed to the Defense Logistics Agency (DLA) as is currently done.

Contract parts depots operate under "requirements" contracts that specify terms and conditions of sales. The MMA can choose among the authorized sources for the fastest and most economical response.

Components are shipped by the appropriate mode (depending on priority) from the contractor directly to the MMA. Cost of components plus a prenegotiated surcharge are billed against the MMA's impact account. Defense Finance and Accounting System pays the banking institution once a month. The MMA verifies purchases from shipping invoices and monthly itemized charge bills.

The contractor uses "state-of-the-art" inventory management systems such as

manufacturing resource planning (MRP), COOP, and ERP (both commercial software packages). MRP and ERP track components at every step in the manufacturing process (inbound shipping status, projected assembly line need dates, status of components pending assembly line use, work-in-process, and components on hand). COOP is similar to MRP systems except that it's mainly a warehouse item tracking system. Through software such as MRP, contractors know what is on hand (and where), what is inbound from subcontractors, and if an item can be pulled from the manufacturing process without delaying production. Contractors also have the ability to use the capacity of their vendors to supplement their own. For example, a diesel engine manufacturer who supplies the

"Contractors also have the ability to use the capacity of their vendors to supplement their own."

primary contractor may agree to ship an engine within 48 hours after one has been requested. The engine manufacturer would always have an engine in stock to meet this requirement. It would not be a problem for several thousand manufacturers (subcontractors) to keep an inventory of the items they make on hand; most normally have a stock of items on hand that are waiting to be sold. However, for the government to keep the same items on hand would require a huge investment in inventory, facilities, and a system to distribute the items.

Funding. Each MMA that supports and maintains the FMTV would use a special "impact card" account for this purpose (through a national banking institution).

The impact account would be funded from the unit's operation and maintenance funds. Local commanders should determine the dollar limitation (if any) to place on the account. (DLA imposes a \$25,000 transaction limit on their accounts; NASA allows up to \$100,000.)

CONCLUSION

Modern civilian manufacturing and distribution systems have reduced delivery response times from weeks to just a few days (or overnight). Taking advantage of these efficient systems will greatly improve component availability while reducing the inven-

"Modern civilian manufacturing and distribution systems have reduced delivery response times from weeks to just a few days (or overnight)."

tory and costs of existing government depot operations. The government should adopt a contractor-managed parts process to stream-

line the traditional depot system, where it is advantageous to do so.

CONCEPT OF OPERATIONS

HISTORY OF THE TRADITIONAL SUPPLY PROCESS

At the onset of World War II, massive quantities of military equipment and supplies were manufactured for the American fighting forces. As new tanks, ships, and airplanes reached foreign soil, it became clear early on that a system of support was needed to identify and distribute supplies to those distant battlefronts. A team of hand-picked men, led by Col Tex

Thornton of the U.S. Army Air Corps, was sent to Harvard University to learn statistical techniques. Their role during the war was to collect and analyze data on such things as aircraft on hand, aircraft operational, supplies on hand, and numbers of able-bodied personnel. This select handful of men known as the Army Air Corps—Statistical Control determined the logistical needs of the fighting forces. Their work allowed planners to know on any given day what was needed and where.

At the war's conclusion, Thornton and his team were released from the military back into civilian life. Thornton assembled a team composed of himself and nine others who had been part of "Statistical Control." Through Thornton's efforts, this team was hired by Henry Ford II in November 1945 to work as Henry's personal assistants. Within the Ford hierarchy, this group became known as the "Whiz Kids." A year later Thornton, who had been too ambitious in his attempt to become president of Ford Motor Company, was fired by Ford and went to California to strike out on his own. After several years building the Hughes Aircraft Company into an industrial giant from its meager beginnings as a hobby of Howard Hughes, Thornton bought a little family-owned company that made microwave ovens: Litton Industries. Litton, with Thornton as chairman, also grew to become an aerospace giant. Thornton is best remembered as the father of the conglomerate movement of the 1960s.

The members of Statistical Control remaining with Ford instituted the same quantitative techniques they had introduced to the Army Air Corps. The emphasis at Ford then moved from quality to efficiency; a system that nearly destroyed the business

in the 1980s after high-quality Japanese automobiles appeared in the marketplace. Of those Whiz Kids remaining with Ford, the most famous was Robert McNamara, who after just being named as the new president of Ford Motor Company in the early 1960s, was recruited by President John H. Kennedy as Secretary of Defense. McNamara brought the same quantitative approaches to his management of the DoD that he had imposed upon Ford Motor Company. His tenure lasted through the early years of the Vietnam conflict, but the effects of his philosophies can still be seen in our present-day system of supply. Although new weapons systems have been introduced, and some streamlining of supply channels has occurred, the process remains basically the same as it was during the Vietnam era.

THE TIERED REPLENISHMENT PROCESS

Below are attributes of the supply process that supports military series vehicles.

- At maintenance activities, mechanics investigate malfunctions reported by the operators. Once they have itemized on the work order all of the components needed to place the vehicle back in service, the list is forwarded to Materiel Control.
- A materiel control specialist researches the parts identified by the mechanic, and determines whether or not the item is centrally managed by a depot. Depot managed parts are assigned federal stock numbers while commercial parts (for commercial off-the-shelf vehicles) use manufacturer part numbers. If the item is centrally managed, as is the case with military series vehicles, the

materiel control specialist would submit a request into the supply system computer. In the meantime, the vehicle awaiting repairs would be stored in its dismantled state until the required components arrive.

- When the materiel control specialist placed the order into the supply system, the computer registered a "demand." After a certain number of demands occur within a specific period of time, the computer flags the item for a stockage level in the local warehouse. The more demands that occur, the higher the level of stockage. The repair shop can also request that a special level of stock be maintained for selected parts, even though the demand for the items may not be sufficient for automatic stockage based on consumption.
- If the part requested by the MMA is physically on hand in the local warehouse, the supply system computer locates the part and fills the request. If the part is not on hand, then the request is forwarded to the supply depot.
- The supply depots currently have a variety of functions:
 - First, each item procured is assigned a federal stock number and placed under the responsibility of an item manager. The item manager uses consumption estimates from the supply system to predict what the annual numbers of an item would be.
 - Then the item managers' estimates are used to plan the Industrial Stock Fund budget. The stock fund is a revolving account that is used initially to

purchase inventory. Once sold to the end user, the stock fund is reimbursed from unit operation and maintenance funds.

Next, contracting officers use the item managers' numbers to solicit bids from potential contractors and to eventually purchase the items for stockage in the warehouse. Products in the depot flow to local supply warehouses for either inventory or to meet an immediate need.

When a manufacturer enters the government contracting arena, the effects can be profound. Take, for example, a family-owned company that manufactures lawn mower air filters. The owner of the company decides to bid on a contract to supply air filters for M-Series trucks. The solicitation would require the manufacturer to make

"When a manufacturer enters the government contracting arena, the effects can be profound."

deliveries over the next year of 100,000 truck filters, with the first delivery of 10,000 filters required within

the first 90 days. To meet the demands of the contract, the small company must hire 30 additional people, buy several new machines, and add space to the facilities to accommodate the additions. Since the contract is only for 1 year, the risks are high that there would be no follow-on contracts. Therefore, the owner must include ramp-up costs in the bid. If the company does not get the follow-on business, the extra people (who were initially untrained but, over time, became productive employees) must be let go. The new equipment could be sold at a heavy discount or retained for

possible future work. Unless the additional facilities were rented, the costs of the additions must be absorbed along with the usage costs of the equipment and training costs of personnel. These costs must be included in the costs of the parts sold to the government.

As units are manufactured and shipped to the depot, the depot fills its bins with the huge quantities it needs to supply all its military customers. Then as the customers order the components, the depot must process the orders, handle the stock, and ship to the requesters. Until the stock is purchased, the depot has its stock fund tied up in inventory. The stock fund has a dollar ceiling, so it is possible not everything needed can be purchased at one time. Limitations must be placed on stockage levels (for example, the inventory might be held at 90 percent of the established requirement). For this system to work, the government must maintain a large inventory and must operate a distribution system that spans the globe.

THE MODERNIZED DISTRIBUTION SYSTEM: INDUSTRY INTEGRATED LOGISTICS

THE PARADIGM SHIFT: WAREHOUSE OR DEMAND-BASED CONCEPT TO BEST COMMERCIAL PRACTICES

Up until the early 1960s, products moved from the manufacturers through a system of brokers, jobbers, wholesalers, and retailers. The typical manufacturer was one that made most or all of the products sold. Manufacturers used a system known as vertical integration. For example, a company that made ketchup would make the product, but might also

own the tomato farm, the tomato packing plant, trucks to move the tomatoes to the ketchup plant, a bottle plant that made the glass bottles, a label printing operation, and another trucking operation to move the product to customer's warehouses. In recent years, companies have found they can save by outsourcing operations they once had integrated into their own operations. The same manufacturer of ketchup today would use contract growers to provide the tomatoes, contract carriers to move both the raw ingredients and the finished product, a printer for the labels, a plastics company to supply the bottles and a twist-off plastic cap, and finally, another manufacturer to actually make the ketchup and fills the bottles. The ketchup company can virtually outsource every aspect of its operation to the point that it makes nothing in-house; it only coordinates manufacturing activities and sells its products.

The distribution of products has followed a similar genesis. It's no longer necessary to own a fleet of trucks nor is it necessary to deal with a chain of middlemen. Sam Walton, founder of Wal-Mart Stores, found that by dealing directly with the manufacturers and eliminating the middlemen, the products could be moved much quicker and at discount prices. The advent of trucking deregulation has encouraged whole new transportation industries. Today Federal Express, United Parcel Service, and others can move products from the manufacturer to the customer in a fraction of the time involved in the DoD system. With today's technology and infrastructure, products can (and do) move from an outsourced manufacturer directly to the end user without ever appearing on a store shelf (and if need be, over-

night). The concept of operations proposed here capitalizes on today's technology and commercial infrastructure to move military materiel from the manufacturer directly to the end user.

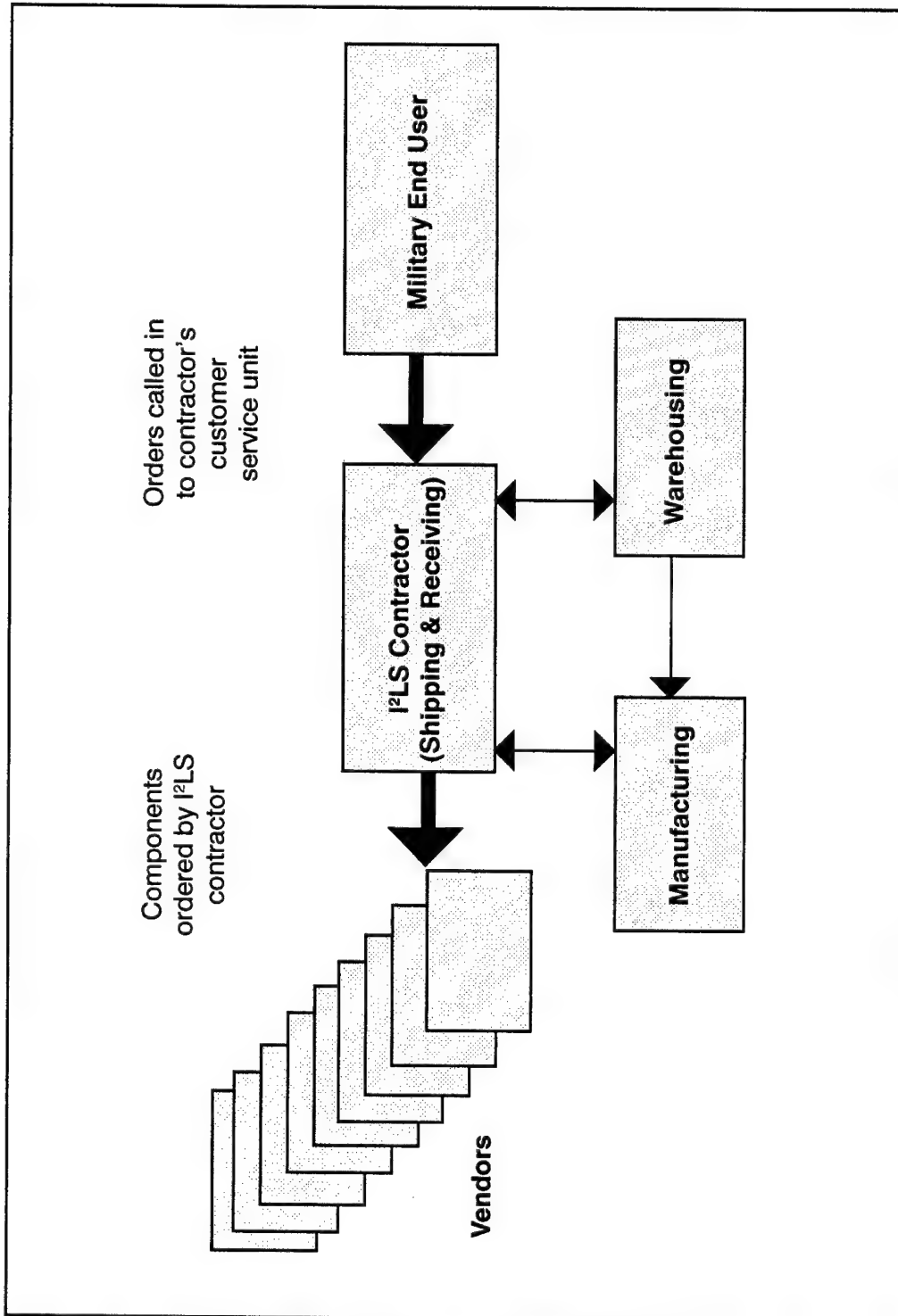
THE INDUSTRY INTEGRATED LOGISTICS CONCEPT

Under the new concept, the military depot could continue to procure, store, and distribute materiel that would not be advantageous for contractors to handle. However under the proposed concept, most items presently managed by military depots would be very appropriate for the industry integrated logistics (I²L) concept. The role envisioned for the depot would change from active retail operations to a role of managing

"In recent years, companies have found they can save by outsourcing operations they once had integrated into their own operations."

war reserve materiel. Although this might involve warehousing of certain critical items, even war reserves can be held (and later distributed) by contractors. The depot's role change then would be toward contract management of war reserve materiel. The depot responsibilities that would decrease at the onset of moving to industry logistics would be for major defense systems in the production stage (such as military vehicles, aircraft, and armament systems).

The program manager would solicit a prime I²L system (I²LS) contractor for logistics support. A contractor of a major defense system would be a logical candidate for the logistics support of that system. This contractor could easily integrate



I²LS Flow Diagram for Requisitions

the flow of replacement components into their existing timed delivery system. The multiyear contract (see specifics in the implementation plan) would require the contractor to provide a specified level of service. The level of service would correspond to performance factors such as fill rates or operational availability over a specified period. The contract would not specify stockage levels. Instead, the contractor would be responsible for setting up a system that met the performance demands of the contract. If war reserve stockage is needed, the contract would specify items that must be shipped within 24 hours of notification. Meeting this time constraint might require the contractor to maintain these items on stock. The choice on stocking level decisions remains with the contractor. However, the government could test the system from time to time to verify contractor performance. At post-production of a system, there obviously would no longer be timed delivery to support the prime contractor's manufacturing operation of that system. When post-production occurs, a follow-on contractor must continue these responsibilities.

Stock number identification of components in I²LS would not be needed. Instead, all items would be identified by manufacturer part number (probably with a stock class prefix). The prime contractor would publish an itemized list of components, with each item having a prenegotiated price. Price changes would be coordinated through the program office. The contract would allow an added surcharge for each item purchased by the customer. A reduction in the surcharge would be assessed for performance below the acceptable level (default would occur at a specified level of unacceptable performance).

The distribution system employed by the contractor would not be specified by the government, but would be determined by the contractor. The contract would also specify the performance reporting requirements of the contractor.

All items purchased through the contractor's system would be paid from operation and maintenance funds. Every activity involved would be issued an impact account funded from their funds. An MMA or supply activity would have a designated account custodian who would be responsible for controlling the purchases and verifying that

"The distribution system employed by the contractor would not be specified by the government, but would be determined by the contractor."

purchases were received. Instead of inputting a requirement into the MILSTAMP (military standard transportation and movement procedures) and MILSTRIP (military standard requisitioning and issue procedures), requests would go directly to the applicable contract source. The contract source would then direct ship the materiel to the requesting end user. This is known as direct vendor delivery.

When a maintenance activity needed an I²LS component, they would request the item by manufacturer's part number through their MMA. If the item were on hand, the MMA would release the item to the maintenance activity. If the item was not on hand, the MMA would order the part directly from the contractor-operated depot, citing the maintenance activity's operation and maintenance funds. The local supply system has the opportunity

to capture the demand data for local inventory management purposes. The MMA would then contact the customer support centers of the prime parts vendor and request delivery of the part. Orders would be placed by telephone followed by a faxed hard-copy of the order. The contractor could also provide direct computer access to their ordering system.

THE CONTRACTOR-MANAGED COMPONENT SYSTEM

The process described here is a template for a contractor-managed component system. This approach, if implemented by a contractor, would provide a high delivery rate at a cost much lower than that currently used by the DoD-managed system.

The contractor-managed organization. The organization should consist of a chief executive officer (with administrative staff), a customer support center, and component shipping and storage facilities.

"The [customer service center] has no geographic limitations; it can be located anywhere that is accessible by telephone communications."

This, in itself, is not unique. What makes the concept different is the functions performed by the CSC, and the use of state-of-the-art item tracking systems. The CSC is the lead business activity of the organization. Through the CSC, sales are generated, customers are helped, and account billing occurs. But most important, the CSC tracks and coordinates items shipped directly from vendors to the ultimate customer. The component shipping and storage facility handles and stores a limited number of items that

customers might need faster than the system can otherwise provide and for components intended for sale in the same geographic area.

The customer service center. The CSC has no geographic limitations; it can be located anywhere that is accessible by telephone communications. Through its streamlined structure, it can operate with as few as 10 employees for each \$2 million in gross sales. The CSC is the business development arm of the system, and is the nerve center for all component sales. The types of people needed by the CSC would be a single operations officer, customer liaison representatives, component research specialists, commercial account representatives, government account representatives, and account paying, billing, and collecting.

Account representatives would actively solicit business for both commercial and government activities. These members have both sales and contracting skills but would refer proposals through legal counsel (although legal counsel need not be part of the staff). For government business, a single contract for each agency (e.g., DoD, Department of Energy, Department of Agriculture) would define terms and conditions; for commercial business, an agreement spelling out terms and conditions of sales would be used. The terms and conditions for both government and commercial customers would be similar. Differences would be in the unique requirements of each of those business segments. It is the primary function of the account representative to generate new accounts and service existing ones.

Customer service representatives would be the point of sale for the organization. Customer service representatives would

take orders, then create the computerized order record, request availability of items from the research specialists, advise the customer of the availability of the items (within 2 or fewer hours), and finally, confirm the order with the customer. With computerized ordering and with outsourcing, limiting the number of items on an order to "one" eliminates the need for consolidation of an order before final shipment (as is the case with traditional systems, where many items might be on a single invoice). Items could instead be shipped directly from off-site vendors to the customer, with only information and money changing hands. Any consolidation of shipments would be handled by the responsible vendor's shipping department. (It also would be possible for the shipping vendor to include the primary vendor's invoice and label with the shipment.) Wartime requirements could still be processed through this system. In the case of the Army, the MMA would assume responsibility for consolidating materiel and getting it moved into remote wartime theaters of operation. For the Air Force, property would be consolidated at a central receiving area and moved by aircraft into the theater of operations. The priority freight carriers would deliver to the entry point for the wartime logistics systems. It is essential that wartime logistics systems be maintained during peacetime. Those systems can be adapted to take advantage of the I²LS interfaces.

The research specialists would receive new computer records generated by the customer service representatives, then query the resource tracking system to locate the items and establish estimated delivery times. The CSC would check

availability of an item from possible sources in the following order:

- at company-owned warehouses (preferably one closest to the customer);
- in the MRP II system for components held in the production plant component staging area awaiting movement to a work station (if the production schedule permits); and
- from vendor sources.

Once a customer service representative has confirmed an order based on the research specialists' estimated delivery time, the order is marked for fill and the computer system sends fill notices (with requested delivery dates) to each source indicated by the order. The established estimated delivery time is based on times established either contractually or (if not otherwise spelled out) by the best judgment of the research specialist. The delivery date specified to the customer becomes a "not later than" date, and performance of the CSC is measured against its ability to meet those dates.

Account representatives have access to the computer records for their accounts, and receive continual updates on the status of orders outstanding. It is the responsibility of account representatives to monitor actively the status of orders outstanding and facilitate deliveries to the customers. When there is a problem, the account representative works on the

"Customer service representatives would be the point of sale for the organization."

customer's behalf to resolve it. If an order does not meet the established delivery date, the account representative must work out an acceptable solution for the customer. The account representative re-

"The CSC could act as purchasing agent for the manufacturing arm of the parent company for all items purchased for the assembly line."

ceives the notice from the source when an item has been shipped and receives notice when the item reaches the customer. It is the account repre-

sentative's final duty to confirm with the customer that the item was, in fact, received. At that point, the invoice is marked in the system as complete. The order then becomes available for billing. The account representatives are graded on the "dollar" value of invoices released for billing, and average age of invoices released for billing.

The accounting group oversees payments to the company's vendors, and billing and collections from customers. The computer system performs account consolidations, then bills the appropriate accounts and establishes an accounts receivable record, or establishes an accounts payable record (in the case of company purchases from vendors). The majority of the accounts receivable are billed and paid through major credit cards. The customer receives an itemized bill from the credit card company and verifies the purchases by comparing the reference numbers on the bill to the actual invoice shipped with the component. This group is graded on "dollars" collected and vendor payments made on time.

The CSC establishes agreements with sources of supply worldwide. The

agreements specify such things as expected level of quality, delivery time requirements, computer system interfaces, and billing arrangements. The CSC has no responsibilities for warehousing, shipping, or receiving of the physical products. These functions are performed by the vendors and by the storage and shipping activity (for those items on hand in that facility). The CSC could act as purchasing agent for the manufacturing arm of the parent company for all items purchased for the assembly line.

The storage and shipping activity. This activity's primary purpose is to receive and store components: intended for the production line, for components specified by a customer for emergency on-hand items, and for those items that must be on hand to meet contractual delivery schedules (e.g., items that have too long a lead time from vendor sources to meet contractual delivery dates).

The warehouse receiving function processes all items delivered to them. The items are entered into inventory by scanning bar code labels on the containers and physically placing the items in designated bin locations. The items reside in their bin location until needed. The computer system notifies warehousemen when it's time to pull an item and move it to another location. As an item moves through the shipping activity, the package's bar code label is scanned at each work station. If the item is for a priority, the item is immediately marked as such when it is pulled. The item is then prepared for shipping (or delivery to the manufacturing staging area) ahead of lower priority items. Two preparation areas exist: one for domestic shipments and one for foreign. While an item is being prepared for shipment, the appropriate

shipping office (foreign or domestic) prepares the shipping order with the appropriate shipping class and carrier for the priority. If other lower priority items are scheduled for the same location, those items are included in the shipment and shipped with the priority item (provided this action does not delay shipment of the priority item). The stockage level of items also held for emergency purposes (such as war reserves) would never be reduced below the emergency level (unless needed for a contingency). As production stock is received, items identified as war reserve would be removed on a first-in, first-out basis. This would ensure that the on-hand inventory is always the most recent version used in production. The CSC has visibility into components located both in the warehouse and on the production line (likewise, the production line has visibility into the warehouse's inventory, and the availability of components from vendors with outsourcing agreements). This is possible because of an integrated resource planning software system such as MRP II.

Contract vendors. Every component that is outsourced can be delivered to end users directly from vendors who are under agreements to perform within specified times. The CSC would establish agreements with these vendors, specifying how rapidly an item might be shipped and where it would be shipped. The vendor isn't told how much and what to maintain in inventory. The vendor is only responsible for meeting the delivery times, even though this may require the vendor to keep some items available on the shelf. It is reasonable to expect a manufacturer to have a certain quantity of finished products on-hand that have not been sold (except for custom items).

Regardless of whether an item is a custom item or something in widespread use, the vendor decides whether to store an item or risk a monetary penalty for missing a delivery time.

Because the CSC can count an individual line item as an order, every vendor involved can ship directly to the end-user. This eliminates the need to physically consolidate an order at the CSC for items coming from multiple subcontractors, saves excess shipping costs, and dramatically shortens the shipping time. This makes sense when one considers the number of items involved in a single major system (a typical automobile has more than 14,000 line items); and what is involved in a depot system in both cost of inventory and warehouse space to keep all the potential items needed on hand. We can invest in an expensive inventory that takes up a lot of warehouse space, or, since these items are commercial off-the-shelf, we could expect some of these items to routinely be on hand at the respective manufacturers. They are already storing the items. If

"Every component that is outsourced can be delivered to end users directly from vendors who are under agreements to perform within specified times."

delivery can be made in just a few days through express shipping methods, we can eliminate the need to buy any of the items until they are needed. This also eliminates inventory that is bought but may never be needed. In the meantime, the CSC tracks the items and ensures the customers get their components as ordered.

Vision for a new system. Modern commercial distribution systems can allow

DoD to outsource component replenishment for many current programs. The contract envisioned for a contractor-managed parts replenishment system rewards the contractor for meeting a high percentage of demands, but incrementally reduces the contractor's fee at lower levels of performance. Success of this concept depends on the contractor's ability to meet the delivery schedule—a tasking that can be accomplished only through:

- modern inventory control software;
- bar code tracking of inventory;
- express shipping; and
- delivery agreements between the prime contractor and its vendors.

Since this concept takes advantage of streamlined delivery techniques, a large investment in facilities and inventory by DoD is no longer necessary.

IMPLEMENTATION PLAN

An implementation plan should be developed jointly among the government agencies involved, and the contractor. The plan should describe the process to be implemented and a schedule for implementation. At a minimum, the plan should

cover the events and times to transition from the traditional depot supply system to the contractor-managed concept. It should cover these areas:

- identification of key decision-makers;
- responsibilities;
- contractual arrangements;
- resources required;
- changes needed to current policies and procedures;
- a schedule of events; and
- a plan of operation after implementation.

The concept of operations should be used as a guide to develop both the implementation plan and the plan of operation. The concept of operation describes "why and what" should be done, the implementation plan describes "how and when" to begin, and the plan of operations describes "how and what" should be done to operate the program. The contractual arrangement between the government and the contractor should reflect the concept to be employed in the process. The following sample contract contains some of the clauses that could be used for this agreement.

SAMPLE CONTRACT CLAUSES

SAMPLE COVER SHEET

Plant/shipping location: _____

Inspection office: _____

Any reference to _____ (Contractor _____ cited as _____.

This is a requirements contract effective from _____ through _____
{3 years}.

The Government has the option to extend the terms of the contract for an additional two years to be exercised in 12-month periods. Notice of intent to exercise the option must be furnished to the contractor 60 days prior to expiration of the contract.

Additive CLIN 9905 establishes a financial account for transportation costs, markup for inventory management, and storage and handling cost, which are reimbursible and will be shown as a separate item on the invoice.

Each customer will certify and validate _____ invoices within two working days after receipt and then forward to DFAS-CO for payment.

The procuring contracting officer for this corporate contract is _____
at (XXX) XXX-XXXX.

All orders WILL be shipped and packaged IAW best commercial practices.

Routine requirements will be shipped in eight calendar days ARO, if in inventory and will be shipped via the least costly mode.

NMCs or AOGs (aircraft on ground) (identified by three digits as 999, N-and E-) will be shipped in 48 hours ARO if in inventory. NM

+Cs (AOGs) are not currently identified on electronic data interchange (EDI) orders. _____ will receive a telephone call from the cognizant emergency supply operations center (ESOC) or a fax from each cognizant inventory control point (ICP) to identify when an NMCs (AOGs) order has been sent. NMCs (AOGs) requirements will be shipped via fastest commercial mode.

The 24-hour number (voice mail after normal business hours) for NMCs (AOGs) is _____ and the fax number is _____.

Foreign military sales (FMS) requirements will be handled by faxed transmission from each center and will be shipped by the same mode as routine and NMCs (AOGs) requirements depending on the priority.

DCMC has agreed to monitor shipping on a spot-check basis.

The following clauses are deleted from this contract:

52.215-22	252.215-7000	252.227-7029	252.227-7019
52.215-23	52.215-9G01	252.227-7031	52.230-2
52.215-24	252.227-7013	252.227-7036	52.230-3
52.215-25	252.227-701B	252.227-7037	52.230-5
52.215-30			

Clause 52.210-9G33 (proof of principle [POPs—computer compatibility]) is updated to read 90 days in lieu of 60 days.

Clause 52.229-3 federal, state, and local taxes is deleted. _____ letter, dated XX XXX XX, containing their representation relative to the inapplicability of FAR clause 52.229-3, as well as FAR clause 52.229-4, is incorporated by reference in this award.

A maximum electronic delivery order limitation of \$25,000.00 is made a part of this contract.

Inventory transfer and EDI turn on will be as follows:
{time schedule for critical events}

DGSC will provide written authorization to the DCMC for a blanket modification to change the ship to location from a DLA depot to "XXX" {contractor}, {state} on existing due-in for part numbers included in the corporate contract after the inventory transfer has begun.

ICP's POC for EDI is as follows:

Each ICP's POC for the financial transactions is as follows:

Each ICP's POC for the materiel management transactions is as follows:

Unit prices for NSNs referenced in this contract as "TBSP" (to be separately priced) will be added by contract modification once _____ has developed a unit price and DPRO had approved the item for inclusion in the military spares price list.

Customer returns will go directly back to the contractor. Contractor will recognize a return policy based on best commercial practices.

Comprehensive subcontracting plan is made a physical and material part of this contract.

The contract data requirements list and the special contract requirements to include materiel management reports and financial transactions reports are made a material

Concept of Operations and Implementation Plan for Industry Integrated Logistics System (I²LS)

part of this contract.

PR XXXXXXXXXXXX

Item description:

PR XXXXXXXXXXXX

See attached list for items

Qty variance: Plus 0%

Minus 0%

Inspection point:

Origin

Acceptance point:

Origin

Prep for delivery:

ASTM-D-3951-90, MILSTD 130G applies

Delivery FOB: Origin per schedule in contract

Section B

PR XXXXXXXXXXXX

Cont'd

9905	Shipping/handling/transportation costs/markup	To be shown as a separate item on invoice
9912	Contract data requirements list IAW DD1423	Not separately priced
9912AA	Material management report (SEQ.A001)	Not separately priced
9912AB	Financial transaction report (SEQ.A002)	Not separately priced

Remit payment to:

Electronics Funds Transfer

Chase Manhattan Bank, N.A.

195 Broadway, 16th Floor

New York, NY 10081

American Bankers Assn.

52. 216-9G16 Corporate Contract—Fill Rate

(a) *Definitions. As used in this Clause:*

“Fill rate” means the percentage of the total quantity of the items ordered which are shipped within 8 calendar days of receipt of order. For example, if 10 orders of 10 each are received and 8 shipments of 10 each and 1 shipment of 5 each are made in response to nine of the orders, a fill rate of 85% has been obtained. The fill rate achieved during each semiannual period will be used to set the authorized markup for the following period.

“Receipt of the order” means the date on which the electronic transmission of the requisition/delivery order is made from the Inventory Control Point (ICP) to the contractor. Requisitions will be issued for DLA-owned stock. Delivery orders will be issued for new material.

“Shipment” means the date on which the item is delivered by the contractor to the designated carrier.

(b) *The contractor agrees to provide a fill rate of 90% for the items included on this contract. If the agreed upon fill rate of 90% is achieved, the markup to the Military Spares Price List unit price which the contractor is authorized to charge is {100% of authorized markup}. If a fill rate lower than 90% but greater than or equal to 87% is realized, the authorized markup is reduced {to 92% of authorized markup} If a fill rate less than 87% but greater than or equal to 81% is realized, the authorized markup is reduced {to 80% of authorized markup}. A fill rate of less than 81% is determined to be an unacceptable level of performance. If the calculated fill rate is less than 81% for two successive contract periods, the Government may terminate the contract for default; however, if the contract is not terminated, the authorized markup for a fill rate less than 81% is reduced {to 68% of authorized markup}.*

(c) *Items for which orders are received in the first 6-month period that cannot be filled for any of the following reasons will not be used in the Fill Rate calculation:*

—No Government stock transferred and lead time to obtain stock is greater than the time between inclusion of the item on the contract (i.e., contract award or contract modification) and the time in which the item would normally be included in the fill rate calculation for the next contract period.

—Government Due In not received by the contractor.

—Contractor receives order(s) for quantities greater than the Government-provided annual demand estimate.

(d) The fill rate will be calculated semiannually on a cumulative basis for all orders received in the semiannual contract period. In order to avoid administrative problems, the period of time used to calculate the fill rate and the period of time to which a particular authorized markup apply will not coincide. The contractor will calculate the fill rate for the preceding 6 months when the 10th month of the contract is completed. The calculated fill rate and the data on which this calculation is based will be provided to DCMP within 30 calendar days after completion of the 10th month and thereafter each subsequent 6-month period for confirmation and concurrence of fill rate.

(e) The percentage of on-time shipments will be calculated on a semiannual basis. For this clause only, days will be calculated starting with the first complete day after receipt of the order; for example if the order is received at 4 p.m. Monday, shipment at any time during Tuesday will be counted as shipping on the first day. For the purpose of this clause only, months will be calculated starting with the first complete calendar month after the beginning of the contract, for example, if issue of the contract is 12 August 199X, the first month is September 199X. Complete records of the fill rate will be maintained and made available for Government inspection.

(f) The Government will prepare a modification to the contract adjusting the authorized markup as needed effective the beginning of the 13th month. The subsequent periods for fill rate calculation and authorized markup adjustment will be 6 months from each previous calculation/adjustment. The authorized markup for the initial 12-month contract period is XX% (100% of authorized markup).

52.216-9G19

Corporate Contract—Inventory Transfer

(a) Inventory will be physically transferred from Government depots to the contractor for storage and distribution. The Government will retain title to the inventory. The transferred Government inventory may be used to satisfy both Government and commercial demands. Title to the inventory will transfer to the contractor upon use for a commercial sale. The contractor will notify the Defense Contract Management Command (DCMC) of this transfer by submitting a daily summary of all parts transferred for commercial use. DCMP will use the daily information furnished by the contractor to create daily requisitions while simultaneously giving approval for the commercial sale. The contractor will credit the Government monthly the current Military Spares Price List unit price for all material sold commercially.

(b) The transfer of Government inventory to the contractor will be accomplished in phases. In the first phase, a quantity of Government inventory, which will be determined by the Inventory Control Points (ICP), will be blocked from issue at the depot

and physically transferred to the contractor's facility at Government expense. All parts transferred must be new/unused and must have been sold to the Government by {date} as a new part. The contractor and the DCMP Quality Assurance Representative will jointly inspect the incoming inventory and incorporate it into inventory. A record of this transfer will be maintained by the contractor and provided to the cognizant administration office and the ICP. Any questions concerning the acceptability of the incoming stock or the amount of inventory received will be resolved before the contractor places the stock into its inventory and creates the record of the accountability for the inventory from the Government. Any parts that are not acceptable to the contractor will be returned to the Government at Government expense. If a part is transferred that was not sold by the contractor to the Government it may be deleted from this contract by bilateral agreement. The contractor will work with the contracting officers at the applicable ICP in resolving issues regarding the receipt and acceptance of the DLA inventory. The Government will bear the expense of correction and or disposal of any stock damaged prior to acceptance by the contractor. The contractor will be responsible for this expense after acceptance of the stock by the contractor.

(c) After the contractor accepts the first phase of transferred inventory, the Government will start routing requirements to the contractor via Electronic Data Interchange for the contractor to fill from its inventory. The Government will then issue a redistribution order to transfer the remaining Government inventory to the contractor. The contractor will follow the same procedures for receipt of the second phase and any subsequent phases of inventory transfer as it did in the first phase.

(d) Acceptance of inventory by the contractor creates an obligation to the Government which may be fulfilled by either supplying material to the Government or payment at the Military Spares Price List unit price. Notwithstanding any accident, loss, or damage by the contractor, the contractor is obligated to provide the Government one of the above said reimbursements.

(e) The contractor may commingle the Government inventory with the contractor's current commercial on-hand stock. The contractor shall be responsible and accountable for all Government inventory accepted into stock. The contractor shall provide for preservation, protection, and maintenance of the Government inventory in accordance with sound industrial practices. The contractor will maintain an accountable paper inventory of the transferred Government stock. The standard Government Furnished Property clauses and FAR Part 45 are not applicable to this inventory.

52. 216-9G20

Corporate Contract—Excess Inventory

(a) As part of the review of inventory levels, the contractor may identify Government-transferred inventory that could be classified as excess. The contractor will cross-reference this Government inventory to both Government and commercial demands.

(b) If the contractor identifies Government inventory that is potentially excess in terms of both Government and commercial demand, the contractor will identify these items to the appropriate Inventory Control Point (ICP). If the Contracting Officer at the ICP concurs in writing with the determination that the inventory is excess, the contractor will initiate action to dispose of the excess inventory through Government channels using the resources of the Defense Contract Management Command (DCMP). Excess inventory will be disposed of in accordance with the instructions of the DCMP contracting officer.

52. 216-9G21 Corporate Contract—Government Inventory at Contract End

Notwithstanding contract completion, the contractor acknowledges that a credit at the current contract Military Spares Price List unit price or a replacement part is owed to the Government for all remaining transferred Government inventory. By written mutual agreement of the contractor and the Government, this obligation may be fulfilled by the contractor on a subsequent contract with the Government. The contractor agrees to provide notification to the Government of its proposed method of fulfilling the obligation 120 days prior to the anticipated completion date of the contract.

52. 216-9G22 Corporate Contract—Add/Delete

(a) The Government reserves the right to bilaterally add to the contract new or replacement parts by modification. The price for the new items will be the manufacturer's current Military Spares Price List unit price plus the authorized markup determined by the contractor fill rate performance (see fill rate clause). The Government will unilaterally delete from the Contract items that are obsolete (discontinued by manufacturer) or deleted from the Military Spares Price List. The contractor agrees to notify the Contracting Officer of the anticipated change and will honor delivery orders for these items for 30 days from the date of the notification to the Government. The Government will delete any such item from this contract after receiving the required written notice. If the contractor considers another Military Spares Price List item as a suitable substitute or replacement for the discontinued item, it will advise the Government at the time it advises of the discontinued item. If the Government elects to include the replacement item in the contract, the contract will be modified accordingly. If the manufacturer discontinues an item without replacement, the contractor will advise the Government of an alternate source of supply for a comparable item, if an alternate source is available.

(b) When a new part number is added to the contract, inventory transfer will occur using the same procedures as the original transfer of inventory. These items will not be used in the fill rate calculation for the contract period immediately following addition of the item if no Government stock is transferred and the items fall under any of the conditions cited in 52.216-9G18 paragraph C.

52.216-9G23

Corporate Contract—Price Changes

(a) *Normal Price changes:* Since all items priced in the contract are based on the Military Spares Price List, a modification to the contract revising prices will be issued within 30 days of the issuance of a revised military spares price list. If the change in the unit price is equal to or greater than a 25% increase, the contractor agrees to provide a detailed price justification for that item to the DCMP Contracting Officer responsible for the Military Spares Price List. DCMP will validate the price increases. If DCMP justifies the price increase, the item will remain on the Military Spares Price List. If DCMP is unable to justify the price increase, the item shall be deleted from the Military Spares Price List. If it is discovered that a pricing error has been made, a contract modification or adjustment shall be issued for those delivery orders which incorporated the incorrect price. Any departure from this policy must be agreed to by both the contractor and the Government.

(b) *Extraordinary Price Changes:* Various circumstances that could arise during the term of the contract may render the pricing mechanism of using the Military Spares Price List invalid. For example, a disagreement over forward pricing rates could create a situation in which the Military Spares Price List is determined to be inaccurate and invalid. If the Government determines that the Military Spares Price List is invalid, the contractor agrees to honor the military spares price list prices in effect at the time of the determination for a period of not less than 60 days. The contractor and the Government must agree on any pricing mechanism that will substitute for the military spares price list beyond the 60-day period.

52.216-9G24

Corporate Contract—On-Time Fill of Backorders

A backorder is defined as a requirement for an item that cannot be filled within 8 calendar days of receipt of order. The contractor agrees to ship 90% of all backordered items within 90 days of receipt of the order. The remaining balance of backordered items will be shipped within 240 days after receipt of order. Receipt of the order is defined as the date on which the electronic transmission of the requirement is made from the Inventory Control Point (ICP) to the contractor. Shipment is defined as the date on which the item is delivered by the contractor to the designated carrier. The percentage of backorders filled on time will be calculated on a semiannual basis concurrent with the fill rate calculations.

SECTION H: SPECIAL CONTRACT REQUIREMENTS:

CONTRACT DATA REQUIREMENTS LIST

Notwithstanding any other provisions, terms and conditions of the solicitation/contract, the contractor will be required to make available the following data to the Government for the purpose of reconciliation and accountability purposes.

MATERIEL MANAGEMENT REPORTS: SEQUENCE A001

1. Stock receipted by the contractor.

A. The cognizant DCMP office personnel will work with the contractor in the receipting process.

B. The contractor will inspect incoming inventory and provide counts to the cognizant DCMP. Concerns regarding acceptability of incoming stock will be resolved through DCMP with the appropriate Supply Center prior to the contractor's receipt of inventory.

C. DCMP will confirm the contractor's receipts and will provide counts by NSN and Center to the accountable Supply Center. DCMP will be provided a Point of Contact at each Supply Center to forward inventory counts. Information required from DCMP for redistribution orders received is NSN, document number, quantity receipted, and condition code. For contract lines received, shipment number and contract line item number will also be required. This information should be provided to the accountable Supply Center on a daily basis as DCMP confirms the contractor's receipts.

D. Supply Centers will manually receipt stock to the contractor's RIC daily as information is received from DCMP.

E. The receipting process will extend beyond the completion of redistributing stock until all dues-in on contract or purchase request are accounted for.

2. Processing of requisitions

A. Until all stock levels are drawn to zero, the contractor will be required to submit month-end reports to the accountable Supply Centers of all issues made from transferred stock for commercial and military requirements. The following information at a minimum should be submitted to the Supply Center Point of Contact: NSN, requisition number (the contractor's requisition number if sold commercially), quantity, unit of issue, priority, required delivery date, and ship date.

FINANCIAL TRANSACTIONS REPORTS: SEQUENCE A002

1. SALE: DLA Parts to DLA Customer

A. Submit monthly invoice with two (2) lines (one for handling fee and one for transportation). Supporting documentation must be attached to invoice itemizing NSN, Military Spares Price List unit price, quantity, and transportation costs. One invoice can be for costs associated with sales and returns, but supporting documentation must clearly identify costs associated with sales and with returns separately. The invoice and supporting documentation must be sent to the respective Inventory Management Office at each supply center for validation and certification, after which the package should be sent to Accounting Services Office for verification of funds availability and for forwarding to Defense Finance and Accounting Service Contract Officer for payment processing.

SECTION H: SPECIAL CONTRACT REQUIREMENTS: (CON'T.)

2. SALE: DLA Parts to Non-DLA Customers

A. Will need supporting documentation from the contractor/Inventory Manager (cognizant) for the inventory manager's validation of payment amount from the contractor. (Requisitions by line, NSN, Military Spares Price List unit price and quantity).

CONCLUSION

The entire concept of I²LS requires a paradigm shift from a demand-based system of supply warehouses to a system that hinges on delivery times and order fill rates. This new concept is made possible because of advances in computer and communication technology, and in modern commercial transportation systems. The most difficult paradigm shift to achieve is from a system of extensive government control to a system based on best commercial practices. By allowing the contractor to use "best commercial practices" wherever possible, the process can be continually improved and modernized as technology advances. If current government stakeholders are willing to transfer some of their tasks to private industry without bureaucratic strings attached, the result would be an efficient and economical system. The greatest obstacle would be from those who know and understand the "old" way of doing things and want to hold on to the constraints that the new system attempts to eliminate.

Through I²LS, millions of dollars in obsolete inventory would be eliminated; inventory intended for initial spares would not be erroneously discarded due to lack of demand during the start-up phase of a system; delivery times once considered as premium transportation modes become routine; and what was once expensive and complicated can be less costly and simple. At one time, the term "economies of scale" referred to cost benefits for being large—a privilege enjoyed by DoD for over 50 years. Today, however, the most economical system is one that outsources its processes to smaller more responsive entities. With the current downsizing initiatives, the DoD can no longer continue business as usual. Commanders have been quoted as saying "we must do more with less." The fact is, you can only do less with less if nothing changes. Einstein once commented that "doing the same thing over and over while expecting a different result is insanity." Through I²LS, DoD can provide world-class logistics service at lower cost—we can expect more with less, but only by changing the way we do business.

ORGANIZATIONAL TRUST IN NAVAL SHIP DESIGN BUREAUS *FRANCE, GREAT BRITAIN, AND THE UNITED STATES*

Larrie D. Ferreiro

How mechanisms and issues of "organizational trust" develop and are perpetuated in the professional corps of naval ship design bureaus of France, Great Britain, and the United States provides insight for management theorists studying this developing area. This article focuses on the current and historical roles of these professional corps, and shows how the differences in societal trust in government affect the bases of trust within the organizations. Finally, it argues for the need to maintain naval ship design bureaus that have a strong professional corps, which will strengthen organizational trust and ensure better internal and external relations.

The byword of management theorists is fast becoming "trust", rapidly overtaking "quality" as the measure of merit in an organization. An organization operates more smoothly when there is a high degree of trust internally and with its customers. In organizations, "trust" is based on competence and responsibility, and it is in this context that I'll discuss how trust operates within the naval ship design organizations of these three nations, with a particular emphasis on the role of the professional corps.

A BRIEF HISTORY OF NAVAL DESIGN BUREAUS

Naval constructors (the generic term used here to describe warship designers) are descended from shipwrights, who oversaw the construction of ships the way a master craftsman would oversee the building of furniture. The art of shipbuilding was handed down from master to apprentice, or father to son; it was not until the middle of the 18th century that the slow road toward the professionalization of ship constructors began.

FRANCE

Pride of place goes to France for forming the first professional corps of naval constructors. The *Génie Maritime*, as it was known (*génie* means both engineer and genius), was formed in 1765, and was marked by a rigid system of application into the corps, including the training in shipyards and education in engineering, and a formal system of advancement based on technical merit. The *Génie Maritime* became the model for the naval construction corps of many countries, including Spain, the Netherlands, Japan, and Britain (SPEI, 1965, pp. 11–15). The constructors of the *Génie Maritime* operated autonomously, each in their own shipyards, until 1895, when ship design was centralized into one bureau. In the 1930s it subsumed the Naval Artillery Corps, and in 1961 it became what would be called the *Direction des Construction Navales* (DCN) and was incorporated into the centralized military procurement agency now called DGA, *Délégation Générale pour l'Armement* (SPEI, 1965, pp. 63–88).

GREAT BRITAIN

The Royal Navy was actually slower to adopt the model of the *Génie Maritime* than other navies, in part because it was producing highly successful ships without it. The first efforts began in 1805 under the Barham Commission, which sought to rectify the perceived inferiority

of British warships by, among other things, establishing a formal educational system for its constructors. This effort was short-lived, and it was only in 1864 that a permanent school at Greenwich was created (Brown, 1983, pp. 25–27). Although British constructors often led the world in technological innovations, it was not until the Captain affair of 1871 (when a privately designed battleship sank with almost all hands, and an inquiry board found that the Admiralty constructors were correct in rejecting it) that their struggle for professional recognition was fulfilled. In 1883, a professional body modeled on the *Génie Maritime* was formed, known as the Royal Corps of Naval Constructors (RCNC), whose chief was the Director of Naval Construction. His power gradually waned after WWII, as both the Navy and the British empire shrank (Brown, 1983, pp. 60–95). By 1993, the Ministry of Defence began consolidating the service acquisition agencies into a centralized joint Procurement Executive (PE).

UNITED STATES

The United States did not have anything comparable to the great fleets of Britain and France until the late 19th century, and in its early years the Navy's ships were designed by a curious hodgepodge of both government and private naval architects. Under the Bureau of Construction and Repair (BC&R), a Construction Corps of

Larrie D. Ferreiro is a systems engineer with the U.S. Coast Guard. He was a naval architect at the Naval Sea Systems Command, worked as an exchange engineer at DCN France, and was trained as a British naval constructor at the RCNC course at University College London. He is currently a Ph.D. candidate in the history of science and technology at the University of London. He is a licensed engineer in Virginia, Great Britain, and the European Union.

naval officers was established in 1866. However, formal instruction in ship design was not instituted until 1879, when graduates from the Naval Academy at Annapolis were selected to attend the RCNC school at Greenwich. For two decades, U.S. constructors were educated abroad, until 1901 when a course modeled on the Greenwich school was established at the Massachusetts Institute of Technology in Boston. It was only then that the U.S. Navy had a professional corps of officers that resembled the French and British, in terms of a professional cadre who received a uniform system of training and were held to a uniform standard (USN BC&R, 1937, pp. 34–42). Just before WWII, the BC&R was combined with the Bureau of Engineering to form the Bureau of Ships (BuShips); at the same time, the Construction Corps was disbanded, thus moving ship design into the hands of civilian naval architects. BuShips eventually became the Naval Sea Systems Command (NAVSEA).

NAVAL SHIP DESIGN ORGANIZATIONS TODAY

The post-Cold War downsizing has considerably changed each country's naval design organization, and in very different ways. While the French and British navies are roughly comparable in scale, the United States has a budget seven times larger, with over 3 times as many ships and 10 times the personnel (Ferreiro, 1997, p. 57). The sheer difference in size of the U.S. Navy helps to explain some differences with the other two.

In both the French and the British Ministry of Defence (MoD), the naval ship

design organizations fall under a joint civilian procurement agency, which is separate from the military operational organization. In France, Direction des Construction Navales is the warship acquisition arm of the Délégation Générale pour l'Armement (DGA), and does all ship design in-house. In Great Britain, the PE is divided into a dozen "business units" organized by function and not service; the naval units now oversee warship acquisition, but the actual design work is done by industry. Both DGA and the PE are headed by civilians who report to their respective Defence Ministers, and they contain both the program management and technical support for warship acquisition.

By contrast, the United States Department of Defense (DoD) has a separate procurement agency for each service, in part because of the sheer size of each service—the U.S. Navy budget alone is more than the total military budget for either France or Britain. The Navy organization is a mix of military and civilian structures. The technical support agency for Navy procurement, NAVSEA, falls under the operational side (Chief of Naval Operations [CNO]) and has a military head. However, the responsibility for procurement itself falls under the civilian Assistant Secretary of the Navy for Research, Development & Acquisition, whose Program Executive Offices control acquisition through an operational agreement with NAVSEA (which

"The post-Cold War downsizing has considerably changed each country's naval design organization, and in very different ways."

increasingly shares design responsibility with industry).

THE NAVAL CONSTRUCTORS

"In both France and Britain, the naval constructors are part of a professional corps that has a specific set of educational requirements for entry, and a distinct career path separate from other parts of the civil service...."

vice system with fairly broad educational requirements, and the career path does not allow for rotation except by transfer.

In France and Britain, the naval constructor's education is integral to the professional corps, and indeed is the first step in its development (similar to the role of, say, the Naval Academy within the officer's corps). Almost all French and British naval constructors learn naval architecture at specific schools (in France, ENSTA in Paris or ENSIETA in Brest; in Britain, at the University College London). It is there that the students begin developing the professional and personal relationships that will carry on through their careers, first by getting to know their future colleagues as students, and second by getting to know their professors, who are

civil service, which allows for rotational assignments throughout one's career to afford a broader view of the organization. The United States, by contrast, hires its constructors into the civil ser-

vice system with fairly broad educational requirements, and the career path does not allow for rotation except by transfer. In France and Britain, the naval constructor's education is integral to the professional corps, and indeed is the first step in its development (similar to the role of, say, the Naval Academy within the officer's corps). Almost all French and British naval constructors learn naval architecture at specific schools (in France, ENSTA in Paris or ENSIETA in Brest; in Britain, at the University College London). It is there that the students begin developing the professional and personal relationships that will carry on through their careers, first by getting to know their future colleagues as students, and second by getting to know their professors, who are part of the naval design corps and thus their future bosses. (By the same token, the professors get to know their future employees.) In addition, the students receive training geared to their future employment, as opposed to the more general education given to American students. NAVSEA has no independent professional corps of naval constructors (it is not permitted under the current civil service) with an integral educational path—they do not even need a degree in naval architecture. Thus, the engineers don't begin to form a "community" until after they start their careers, and they never develop the same level of *esprit de corps* as do their counterparts in Britain and France.

Career paths differ among the countries as well. French constructors are military, though operate more as civilians and only wear uniforms in certain postings. Although British constructors are civilian, they have a military rank and must wear uniforms in certain postings. American constructors are civilian. In Britain and France, posts are rotated every few years, and promotions are handled rather like in the military—the new posting depends on the rank. In the United States, there is no rotation, and promotions come only with new jobs. Some points worth noting:

- The career focus is quite different in each country. French constructors become well-rounded but hands-on engineers. British constructors focus on acquiring a wide range of engineering management capabilities. American constructors concentrate on developing their specific area of expertise.
- The rotational assignments in France and Britain can be quite varied, often

including stints in the research and development (R&D) and program management fields, and possibly one or more postings overseas to gain diplomatic experience. The American constructor usually stays in one bureau, slowly moving up the ranks, and tends to be more thoroughly immersed in his or her field. Thus, British and French constructors have a broader but shallower knowledge of the overall process and organization, while the American's knowledge tends to be more limited but deeper in the area of his or her expertise.

CONCEPTS OF TRUST

"Trust" is a relatively new term in the study of organizational behavior, but the precepts have existed for a long time. They have often been grouped under the rubric of professionalism and ethics, although this has generally been limited to the interaction between an organization and the public. Naval ship design organizations are somewhat different in this regard, as their ultimate customers are not the public but the fleet.

The most useful definition for the word "trust" is "a process of expectation"; you believe or trust that another person or organization will do something particular or act a certain way, and base your actions accordingly. The two fundamental parts to this trust are the expectation of technical competence (that the other party will perform a task in a capable way), and the expectation of fiduciary responsibility (that the other party will perform that task with the customer's [or public's] interests placed before their own interests) (Barber, 1983, p. 9).

Another useful definition is that of a professional organization: knowledge, and specifically, the capacity to make decisions based on that knowledge; considerable autonomy (i.e., a high degree of self-regulation); and a high level of fiduciary responsibility (Barber, 1983, p. 136). The degree to which each naval design organization meets these criteria is also a factor in determining how the mechanisms of trust operate.

Finally, the framework for comparing the mechanisms of organizational trust consists of three levels: societal (i.e., between society and government as a whole), which establishes the overall environment of trust; external (i.e., how the government operates with the naval ship design bureaus), which establishes the mechanisms of trust between customer and supplier; and internal (i.e., within the naval ship design bureaus themselves), which considers those mechanisms in both management-worker and co-worker relationships.

"Trust" is a relatively new term in the study of organizational behavior, but the precepts have existed for a long time."

SOCIETAL TRUST

The 1997 legislative elections showed that the French people remain attached to a strong, centralized, interventionist government. About 55 percent of France's gross domestic product (GDP) is government-generated, and many of the largest firms are either state-owned enterprises or ones in which the government is a majority shareholder. Of the three countries, France is arguably the only one in which

"Civil servants come up through a set formation, and unlike in the United States, where the 'best and brightest' form software companies, in France they become public servants."

government workers are held in high regard (the word *fonctionnaire* conveys a measure of utility not associated with the word "bureaucrat"). Civil servants come up through a set formation, and unlike in the United States, where the "best and brightest" form software companies, in France they become public servants. In addition,

France has long perceived that its government offers a higher level of fiduciary responsibility than the market does; even Alexis de Tocqueville

pointed out the tendency of the French people to request state aid in time of need, rather than to form local groups, and of manufacturers to ask the state for protection from competition instead of improving their works (Fukuyama, 1995, p. 235). In short, the French people place a high level of trust in their government, because the state offers both technical competence and at least the perception of fiduciary responsibility.

Post-World War II Britain was as socialist as any country on the continent, and large chunks of industry were nationalized in 1950s and 1960s. There was a clear faith in the fiduciary ability of government to ensure social equity, and the Civil Service was an Oxbridge-trained, nonpartisan body that ran things, if not efficiently, then at least adequately. However, by the mid-1970s the resulting "English disease" of inflation, high unemployment, and endless strikes soured the public on the socialist model. In 1979, Margaret Thatcher

set in motion a chain of events which echoed the groundswell of public opinion; de-industrializing the government and reducing its control over business and private concerns (The Economist, 1996, pp. 6–11). By the mid-1990s the societal trust in British government was much lower. The Labour landslide in Great Britain's 1997 parliamentary elections did not demonstrate a return to a socialist form of government. The government continues to privatize most state-owned enterprises and now runs government agencies like businesses (e.g., they are often headed by a chief executive officer (CEO) on contract, instead of by a political appointee (Osborne, 1996, p. 8). Not coincidentally, this trend toward a smaller, leaner, more efficient form of government has come at a time of lowered public confidence in its workings.

The United States has a long history of mistrust of government and strong belief in the individual. Alexis de Tocqueville, who lamented his countrymen's reliance on the state, noted with apparent awe the Americans' faith in self-reliance. Although in the 1950s and early 1960s faith in government was high, mistrust was re-ignited after the debacles of Vietnam and Watergate, and the failed attempt at the Great Society. Ronald Reagan put his mark on this view by declaring the government to be the problem and not the solution. As with Britain, the relative success of the Democrats in the 1992 and 1996 presidential elections did not signal a return to the ideals of a welfare state. The current efforts to "reinvent government" by dramatically cutting numbers of employees clearly illustrates the low level of trust that society currently holds for the government (Economist 1996, pp. 29–31).

The perception that bureaucrats create more problems than they solve shows their apparent lack of technical competence, and the belief is strong that they are more interested in maintaining their jobs than making improvements, thus violating their fiduciary responsibility. Of the three nations' peoples, citizens of the United States trust their government the least.

EXTERNAL TRUST

The preceding sections have described how the French government operates in a high-trust environment, the British government in an evolving but decidedly lower trust environment, and the United States government in a very low trust environment. The environment affects the mechanisms by which trust is produced. Lynne Zucker, a professor of sociology at the University of California at Los Angeles, identifies three basic mechanisms of trust production. The first is process-based, that is, the gradual accumulation of trust by experience. This mechanism is emphasized in teaming. Second is characteristic-based: the presumption of trust because of a shared background or culture—for example, the “old boy’s network” of graduates from XYZ University. The third is institution-based, i.e., the presumption of trust based on a formal title or organization—such as a patient’s trust of a doctor, or trust in a professional corps (Creed and Miles, 1996, p. 19). These three mechanisms can be classified as collegial mechanisms. To this, one may add two adversarial mechanisms: evidentiary trust (based on an overwhelming accumulation of proof that the other party is providing competently derived, unbiased information); and third-party trust, which, as the name implies, requires an outside

body to verify the information (and this, of course, entails its own trust mechanisms). These last two are the very antitheses of trust, in that they presume an unwillingness by one party (the client) to accept the information provided by another (the supplier) at face value, or with a minimum of confirmation. The mechanisms of external trust can be examined at two levels: first, between the legislature and the executive (specifically, defense); and second, between the executive and the ship design bureau.

Legislative-executive interaction.

Both France and Britain have a parliamentary system, which means that the Defence Minister is chosen from the party in the majority. In the United States, the Secretary of Defense is chosen by the President and may not be from

the majority party in Congress. One result of this difference is that Congress exercises substantial control over the DoD, often reworking the appropriations and procedures,

as well as continuously auditing DoD policies. British and French parliaments exercise limited control over Ministry of Defence budgets; they may approve or reject the whole budget package, but do not usually tinker with the details (Ferreiro, 1997, p. 57). One fallout of this is the greater vulnerability of U.S. administration officials to Congress, and the commensurate need for greater technical support (Brickman et al., 1985, p. 93).

“...the French government operates in a high-trust environment, the British government in an evolving but decidedly lower trust environment, and the United States government in a very low trust environment.”

In the case of the French and British systems, trust between legislature and Ministry of Defence tends to be characteristic-based, as the Minister not only comes from the same party; he is often a strong figure within the party. The United States operates on a more adversarial basis, and the appointment to Secretary of Defense often entails a grilling before the Senate. The trust mechanisms most frequently used in the United States are evi-

"The U.S. DoD relies heavily on the use of a large number of think-tanks such as RAND and the Brookings Institution to formulate policy."

dentary and, to an increasingly greater degree, third-party. An example of the latter can be shown in the formulation of national security strategy.

The U.S. DoD relies heavily on the use of a large number of think-tanks such as RAND and the Brookings Institution to formulate policy. Think-tanks tend to have the ear of congressmen and top officials, far more than do DoD analysts who must operate through their chain of command. By contrast, the formulation of policy in France is very much internal to the MoD, and the few think-tanks that exist have very little input into policy formation (Ranquet, 1997, pp. 5–15). Britain's use of "brain trusts" in formulating policy has historically been very limited, but is on the rise.

Executive-ship design bureau interaction. In both France and Britain, the ship design bureaus within DCN and PE are not part of the Navy, but fall under an independent acquisition organization within each one's MoD. The Navy bureaus do not control the design organizations, but

rather are "customers" in that they set requirements and request products from the design bureaus. In the United States, the ship design bureau NAVSEA is part of the Navy, so in fact the ship designers are therefore not independent of their customers, but rather their agents; there are also several more layers in the U.S. bureaucratic system than in either the French or British systems (Ferreiro, 1997, p. 59).

This, then, calls into question whether NAVSEA's ship design bureau can be defined as a professional body. As stated earlier, it has no recognized "constructor's corps" as did BC&R earlier in the century, or as do the French and British systems. Harkening back to the definition of a professional body (knowledge, autonomy, fiduciary responsibility), it appears to fail on the autonomy test; that is, a profession cannot operate as an agent of the customer and solely for the customer's benefit, but rather must be held independently responsible for its services (Barber, 1983, p. 113). Since NAVSEA falls under the authority of the CNO (the customer for ship designs), it is not a fully independent body in that it falls within the customer's chain of command, and is therefore an agent of the customer. By contrast, the French and British organizations have a higher degree of autonomy by virtue of the fact that they fall outside the chain of command of the operational Navy, and therefore operate as independent suppliers of design services. This difference in autonomy, combined with other factors described above, leads to quite different mechanisms of trust between the executive and design bureaus in each country.

The French organization DCN operates in the highest societal trust environment,

its control by the legislature is comparatively weak, it has a high degree of autonomy, and it is staffed by a professional corps. All the factors are present for a high-trust relationship with the executive, and it appears that trust is produced by all three collegial mechanisms. First, even though personnel rotate, the executive structure tends to remain in place for five to seven years, creating a confidence not found in shorter tenures (process-based mechanism). Second, the executive staff within DGA and DCN are often constructors themselves (characteristics-based mechanism). Third, the statute of DCN as an independent professional body, staffed by a professional corps, makes a strong statement of competence and fiduciary responsibility (institution-based mechanism).

In Britain, the trust relationship between the Royal Corps of Naval Constructors and the executive is far less strong now than before, but the decline is fairly recent. All three collegial trust mechanisms operate to some degree, but less so than in France; specifically, ship designs are no longer produced by the government, but by industry, so the constructor's role is diminished in engineering terms to overseeing the technical product. The most prevalent mechanism, institution-based trust, was possible when the RCNC had considerable autonomy and control over the ship design process, but is no longer a major component since their autonomy and control has dwindled.

In the United States, the trust relationship between NAVSEA and the executive is based on paperwork, reviews, and third-party oversight. Evidentiary trust is the primary mechanism, and the ship design process (DoD Instruction 5000.1)

contains several dozen separate steps, each requiring extensive technical support for decisions and high-level reviews at the Navy and DoD levels; the process can take 10 years. Third-party trust is evident in the Instruction 5000.1 requirement for an independent analysis of cost and operational effectiveness. This is generally performed by a think-tank, such as the Center for Naval Analysis. During the design, the CNO is also guided by independent review councils

"To a great extent, the mechanisms of internal trust are driven by what is required external to the organization."

such as the Naval Studies Board. It should be noted, however, that this use of external consultants is typical in U.S. governmental agencies, and much rarer for British and French ones (Brickman et. al, 1985, pp. 157–168). By contrast, the trust relationships between the old BC&R and the executive appear to have been highly institution-based, similar to the RCNC (although the historical details are sketchy); certainly, the Construction Corps was more autonomous (i.e., they had considerable authority over the ship design process without excessive external control), carried more political clout, and appears to have commanded more external respect than does the current NAVSEA organization.

INTERNAL TRUST

To a great extent, the mechanisms of internal trust are driven by what is required external to the organization. In this respect, it follows from the preceding arguments that the French DCN has the highest degree of internal trust, NAVSEA the

lowest, and the British PE somewhere in the middle. In higher trust organizations, where the self-identity and solidarity is strong, decisions are taken in a less formal process; for example, design criteria may not always be specified on paper, but agreed to on a case-by-case basis. Lower trust organizations like NAVSEA will tend to codify criteria upon which to base decisions (Misztal, 1996, p. 67). The role of

"There is no clear consensus as to whether naval ship design organizations have a future."

the professional corps, as found in France and Britain, is to institutionalize the process of gaining experience, both by

ensuring uniform educational backgrounds and by a consistent career path and formation. Thus there is a higher level of trust between co-workers and between supervisors and employees, since each has been through the same system. This accounts for the fact that British and French constructors are usually given a higher level of responsibility early on, compared with their U.S. counterparts. Also for this reason, British and French constructors are generally more free to interpret their codified rules and standards than their American counterparts, and have more leeway in applying their engineering judgment. In addition, because many program managers belong to the same corps and have followed a similar career path, they tend to invest more trust in the technical decisions of the naval constructors. This shared background also engenders a well-developed sense of *esprit de corps* among the constructors.

And yet, it appears that both the French and British organizations are heading in

the direction of adversarial trust relationships, both externally and internally. Specifically, the global customer and supplier requirement for transparency and accountability (e.g., ISO 9000 standards for quality control) has meant that both the British and French are now beginning to put on paper specific procedures and criteria which had in the past been left to the discretion and good judgment of the designer. The need for clear accountability is also pushing both organizations to more extensive use of third-party audits. In this respect, there is some measure of convergence between the three national design organizations in their mechanisms of trust.

CONCLUSIONS

There is no clear consensus as to whether naval ship design organizations have a future. In all countries, but especially in the United States and Great Britain, the need for the government to have any in-house warship design capability has been called into question. The most common argument is that such capability should best be left to industry, as the Air Force and Army do. My view is that the marine industry, unlike, say, the aerospace industry, does not have a robust-enough commercial sector to absorb design talent in the event of downturns. I believe that the only economic way to retain this expertise, with all the required authority to ensure military requirements are met, is to either keep it within government or endow a permanent outside body to act as the government's agent. Either way, the role of the naval ship design organization is still vital. To remain relevant, that organization should have a robust

professional corps of naval constructors with a uniform educational standard and a rotating career path that is outside the civil service and that provides a broad overview of the organization. These at-

tributes will help strengthen the mechanisms of trust within such an organization, to ensure that it operates more smoothly internally and with its customers.

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WILL COMMERCIAL SPECIFICATIONS MEET OUR FUTURE AIR POWER NEEDS?

Lt Col William P. McNally, USAF

With the decline in procurement dollars for the Air Force, it is imperative that action be taken to acquire our weapon systems at the lowest possible cost while still acquiring effective systems using the latest technologies. This paper addresses one approach of reforming the acquisition system by using performance and commercial specifications vice military specifications. This article addresses how this reform effort must be carefully managed to be effective.

To meet today's national security challenge, the Air Force must maintain its technological superiority by using and maintaining a strong industrial base. The Air Force must do this in an environment of declining defense spending and rapidly paced development of key technologies in the electronics market. In order to meet this challenge, the Air Force must reduce its acquisition costs and remove any barriers to ensure greater access to the latest commercial technologies. On June 29, 1994, Secretary of Defense William Perry issued a memorandum that gave preference to performance and commercial specifications over

military specifications (MILSPECs) and standards (MILSTDs). While the intent of the memorandum is good, its implementation has been overzealous, with the banning of MILSPECs with no regard for the phase of the acquisition, performance information, or whether a commercial specification or standard is available. The Air Force must carefully manage the use of specifications and standards, be they military, commercial, or performance, to ensure access to the latest available technologies while still obtaining a quality product, at the lowest possible cost, that will be supportable in the field.

INTRODUCTION

The U.S. Air Force, along with the entire Defense of Department (DoD), faces a new set of political, economic, and military challenges as we prepare to move into the 21st century. Though the requirements to maintain technological superiority and readiness remain constant, the circumstances have dramatically changed. Defense spending has declined in real terms by more than 40 percent since 1985; while procurement spending has been reduced by 70 percent. The Air Force's procurement spending has gone from one-half of its total budget to about one-third (Druyan, 1995). This decline in procurement spending has resulted in a shrinking defense industrial base. At the same time technology, driven by commercial markets, is evolving at a rapid pace. In the electronics industry, for example, more than 50 percent of DoD's budget is research and development, production, and upgrade of military equipment supplied by the defense electronics industry (Gansler, 1995, pp. 37-38). But the growth of commercial technology advancement in this sector far exceeds DoD-sponsored technology efforts. The design cycle for commercial technology is about 3 to 4 years; for DoD it is 8 to 10 years (Perry, 1994a, p. 3). Many DoD systems are technologically obsolete by the time they are fielded. To survive in this environment, the DoD

needed to reform its acquisition practices. Secretary of Defense Perry outlined this need for change, naming dual-use technologies, use of commercial equipment, and sharing defense technologies as ways of establishing a national industrial base that preserves core defense technologies and reduces cost of acquisition (Perry, 1994a, pp. 2-3).

One of the most important steps taken by DoD to increase access to commercial suppliers and products is to move to greater use of performance and commercial specifications and standards. On June 29, 1994, Perry issued a directive that outlined a preference for performance and commercial specifications over MILSPECs and MILSTDs (Perry, 1994b). This directive recognizes that some MILSPECs are unique, and allowed for a 6-month transition period for implementation. While MILSPEC reform is both well-defined and intentioned, the implementation by the armed services has been overzealous and not properly managed. In most cases, MILSPECs are being banned immediately, without regard for their purpose, the system's acquisition life-cycle stage, or the existence of a commercial specification (Logistics Management Institute, 1996, pp. 1-9). The use of any specification (military, commercial, or performance) must be carefully managed, to ensure that future weapon systems will be affordable, supportable, and meet our war-fighting

Lt Col William P. McNally is currently the chief of the Contracting Policy Branch within the Air Force Secretariat Contract Policy Division. He wrote this paper while attending the Air War College, Class of 1997. McNally has extensive systems acquisition experience as a contracting officer, instructor, and DCMC commander involving many joint programs, as well as Army, Navy, and Air Force program offices.

needs. This management effort should include the adequate research of the available specifications, training of our acquisition workforce, and the use of metrics to measure the effectiveness of performance and commercial specifications. In addition, the effort should allow the flexibility for program offices to determine which specification to use for a particular requirement.

This article will discuss the need for and current efforts in acquisition reform, particularly in the area of MILSPECs and MILSTDs. Then I'll discuss the origin, purpose, and problems of MILSPECs and MILSTDs, and compare that with commercial and performance specifications. I'll give an analysis of the implementation of MILSPEC reform, and recommend actions that will ensure DoD effectively manages the use of specifications and standards.

NEED FOR ACQUISITION REFORM

THE DEFENSE INDUSTRIAL BASE

The U.S. defense industry is characterized by its size and its capacity to mobilize when required. During World War II, it produced 296,000 aircraft, 1,201 naval vessels, 65,546 landing craft, and 86,333 tanks for Allied Powers. Though this industry was demobilized after the war, it was reactivated during the Korean conflict and remained at a wartime level during the Cold War (Gansler, 1995, p. 19). Because of a reduced strategic threat and economic pressures to reduce our budget deficit, the post Cold War era is another time of change for our defense industry. Our nation's leaders realized that this change must occur without severely

affecting our defense capability and our economy. President Dwight D. Eisenhower, who coined the phrase "military-industrial complex," first warned of the potential impact that the defense industry has on the U.S. economy and the importance it has on our national defense (Gansler, 1995, p. 20). Today we must understand our defense industry and consider both the potential impact and benefits to our defense capability that may come out of any changes in DoD.

Our defense industry is made up of contractors who deal directly with the government (known as prime contractors) and the prime contractors' suppliers (known as the subcontractors). For our major weapon systems, the prime contractors are the manufacturers whose primary business is defense. Their lower tier subcontractors provide components, such as electronic parts, that are a key part of the weapon system performance. These suppliers normally provide parts and components for both defense and commercial contracts. For many, the commercial market is a predominant part of their business base. One of the commercial industries that plays a significant role in our weapon systems is the electronics industry.

"The U.S. defense industry is characterized by its size and its capacity to mobilize when required."

DoD AND THE ELECTRONICS MARKET

Technology for the electronics industry is driven by commercial markets and is evolving at a rapid pace. The growth of computers, personal communication equipment, office automation, and factory automation has put the commercial electronics

market significantly ahead of the defense market. And the gap is widening. At the same time, DoD is moving to more information-based requirements involving sensors, computers, intelligence data, communications, and simulations (Gansler, 1995, pp. 37–38).

In addition to the requirement for electronics technology, there is another aspect of the commercial market that is attractive to DoD. Because of intense global

"However, barriers exist: Government-imposed technical and administrative requirements impede the integration of civil and military production activity."

competition, companies in the commercial marketplace have reduced overhead costs, have fewer internal reporting requirements, and have given

more authority to their operating managers. This has resulted in lower costs and an increase in productivity (Kapstein, 1993, p. 190). Because of this competition and the high volume of commercial production, DoD can benefit both in cost and performance if it can integrate its electronics requirements with the commercial marketplace. However, barriers exist: Government-imposed technical and administrative requirements impede the integration of civil and military production activity.

Some of these barriers are administrative, such as requiring contractors to maintain certain cost accounting records and systems for their defense-related work. Other barriers are technical in nature, such as imposing MILSPECs and MILSPECs as contract requirements. Although these requirements had or may still have a purpose, they may limit the suppliers who can

or who want to do defense business. Additionally, these requirements isolate the defense work from commercial work and can make defense business noncompetitive with its commercial counterparts (Gansler, 1995, p. 23). Firms within the same company have to separate their commercial work from their military operations. An example of this can be found at the Motorola Corporation, which operates two separate plants in Phoenix, AZ. The commercial facility is a world-class operation; the defense plant is obsolete (Gansler, 1995, p. 24). Another problem, amplified with a declining defense budget, is the added cost of doing defense work. The American Defense Preparedness Association found that the "cost premium" of unique government requirements has driven the "overhead" cost of doing defense business to two to three times that of commercial work ("Acquisition Reform," 1996).

Acquisition leadership has been aware of this situation for some time. Numerous government commissions and studies have studied the problem. However, until the 1990s, there was not an urgent need to have greater access to commercial products from a technological or fiscal perspective. The required restructuring of the U.S. defense industrial base and the DoD approach toward acquisition could only come about with active government involvement and direction (Gansler, 1995, p. 27). The underlying question was how the DoD could shift from a defense industrial base to a national industrial base.

ACQUISITION REFORM

A major government initiative toward achieving greater access to commercial products and services was the Federal

Acquisition Streamlining Act (FASA) of 1994. A key aspect of the act was the expansion of the commercial product and service definition. Additionally, FASA established a preference on acquiring commercial over military products or services. This removed certain administrative requirements, such as detailed cost and pricing data, for buying commercial products and services. Referring to FASA as an integral legislative vehicle for acquisition reform, Perry commented, "When I came to the Pentagon in 1993, one of my most important initiatives was to achieve real acquisition reform...The real objective of acquisition reform is to allow the Defense department to buy products (weapon systems), not only at lower cost, but also to get higher quality products because we have access to the most modern technology" (Johnson, 1996, p. 6).

The other key issue that DoD faced was the military-unique product and process specifications and standards (MILSPECs and MILSTDs) used to acquire military systems. To address this issue, the Office of the Secretary of Defense (OSD) established a process action team (PAT), to analyze why government specifications and standards were used despite a 3-year-old policy providing a preference for commercial and performance specifications (Perry, 1994a, p. 18). Based on this PAT, Perry issued another significant directive in a June 29, 1994, memorandum, "Specifications and Standards—A New Way of Doing Business." This memorandum became known in the acquisition community as the "Perry Memo." The memo directed that performance and commercial specifications be used when purchasing new systems, major modifications, and upgrades to current systems. If it was not

practical to use a performance specification, a nongovernment standard would be used. When MILSPECs were required, they were authorized as a last resort with an appropriate waiver. Waivers for the use of MILSPECs had to be approved by the Milestone Decision Authority.

The purpose of the memo was to remove the technical barriers that impede the access to commercial products. Both FASA and the Perry Memo

"The ['Perry Memo'] directed that performance and commercial specifications be used when purchasing new systems, major modifications, and upgrades to current systems."

provided the required direction for greater access to commercial products for the acquisition of military systems. They provided a clear preference for the acquisition of commercial products and the use of performance and commercial specifications. However, the use of MILSPECs and MILSTDs was not prohibited and could be used when they were shown to be cost effective and required for system performance.

How the Perry Memo was implemented by the military services and the potential problems will be addressed later. For DoD to keep up with the pace of technology development, barriers had to be removed to allow the commercial side of U.S. industry to have easier access to defense acquisition. Initiatives such as FASA removed many of the administrative barriers, while the Perry Memo removed technical barriers brought about through the use of MILSPECs and MILSTDs. To understand the current MILSPEC and MILSTD reform it is important to trace

the origin of military specifications and standards.

MILITARY SPECIFICATIONS AND STANDARDS

ORIGIN OF MILSPECS

Specifications and standards are difficult to understand, much less reform. The first area to understand is the terminology. Industry uses the term "standards" in relation to both products and processes. In

"Specifications and standards are difficult to understand, much less reform."

DoD, "specifications" are used to describe products, material items, or components, while "stan-

dards" describe methods, processes, or procedures (Office of the Under Secretary of Defense for Acquisition & Technology [OUSDA&T], 1994, p. 17). The origin of MILSPECS came from an attempt to guarantee product performance of military equipment. Any failure of this equipment under the stress of combat and in an often-harsh environment could cause a tremendous loss of military lives and defeat. History has provided some bitter experiences.

In 1879, a column of 1,300 British soldiers was annihilated because their ammunition cases were screwed shut. In 1942, the German army's 48th Panzer Division found that only 42 of the 104 tanks en route to Stalingrad could be moved; mice had eaten the insulation off the electrical wiring of the other tanks. In the South Pacific in World War II, the U.S. supplies shipped to the area at enormous expense were corroded by fungus. Today,

specifications ensure that ammunition boxes can be opened without tools, insulation is rodent proof, and fungus is not a threat (Van Opstal, 1994, p. 10).

PURPOSE OF MILSPECS AND MILSTDs

In the early 1990s, there were approximately 30,000 MILSPEC and MILSTD documents. These documents were viewed as the foundation for our superior military weapon systems (*Washington Technology*, 1992). A military specification describes the essential technical requirements for purchased material that are military-unique or are substantially modified commercial items, and a military standard establishes uniform engineering and technical requirements for military-unique or substantially modified commercial processes, procedures, practices, and methods (OUSDA&T, 1994, p. E-3). Military specifications and standards were created with a great deal of analysis and rationale. MIL-STD 961D, Appendix A, provides for the scope, purpose, requirements, and verification for military specifications. It also establishes the format and content guidelines for program-unique system, item, software, process, and material specifications. Its purpose is to establish uniform guidelines, define essential requirements, ensure verification methods for each requirement, and aid in the use and analysis of requirement content. Most important, it defines the analyses, modeling and simulations, demonstrations, and tests to be performed in order to ensure that the product, material, or process conforms to the essential requirements (OUSDA&T, Standardization Program Division, 1996).

Specifications and standards are not unique to military acquisitions. They are

used by quality manufacturers and suppliers around the world. For example, they ensure that plugs from different appliances fit into the same electrical outlet and that light bulbs fit into standard fixtures (OUSDA&T, 1994, p. 17). For the military, the rationale for specifications and standards is driven by the special requirement of fielding many advanced systems that have to perform under the stress of combat with critical logistical requirements. If any system breaks down in the field, such as an M-1 tank, the military wants to ensure that there are not five different versions of the spare part required to make the system operational again. Standardization is required for spare parts and the maintenance manuals to repair the systems. The lack of standardization would create a logistical problem that would get even larger if each Service were to stock different versions of the same component for each of their systems (OUSDA&T, 1994, p. 18). One of the key standardization issues for military weapon systems is interoperability and interchangeability.

The first question asked is whether a part is going to be repaired or replaced. If the part can be thrown away, then all that is required is a performance specification that defines the performance and interface requirements of the item. Under this situation, performance of the part within a larger system becomes the key requirement. But if the logistics plan calls for a part to be repaired in the field under battlefield conditions, the configuration of the parts must be identical for the stockpiling, maintenance, and training requirements to be effective. This would require a detailed, military-unique design specification (OUSDA&T, 1994, p. 18).

MILSPECS PERTAINING TO ELECTRONICS

Since a key part of acquisition reform was to improve the access to the commercial electronics market, it is important to understand the role of MILSPECS and MILSTDs in that market. When developing contract requirements, a number of issues need to be addressed. As mentioned above, logistical considerations need to be determined and specified. Other key requirements are the functionality and operating environment of the system.

The contract requirement process flows down at the system level but its influence is at the parts level. Integrated circuits (IC) are a critical component for many of our military systems. Figure 1 describes the requirements process flow and the role MILSPECS play in IC part selection, design, and manufacture (LMI, 1996, pp. 2-10, 11). This process starts at the system or device level, with contract requirements outlining the functionality, operating environment, and logistic requirements of the system or device being procured.

As Figure 1 shows, system performance directs the IC device requirements. As you go down the requirements process, there are a number of decisions that either direct particular parts from a military parts list or allow the contractor to choose to use a commercial part. Commercial ICs are frequently not used because of insufficient data supporting their capability of operating in the environment required for

"Bounded discretion is caused by the sum total of all the bureau pathologies, which deflect energy and effort from those activities that really matter."

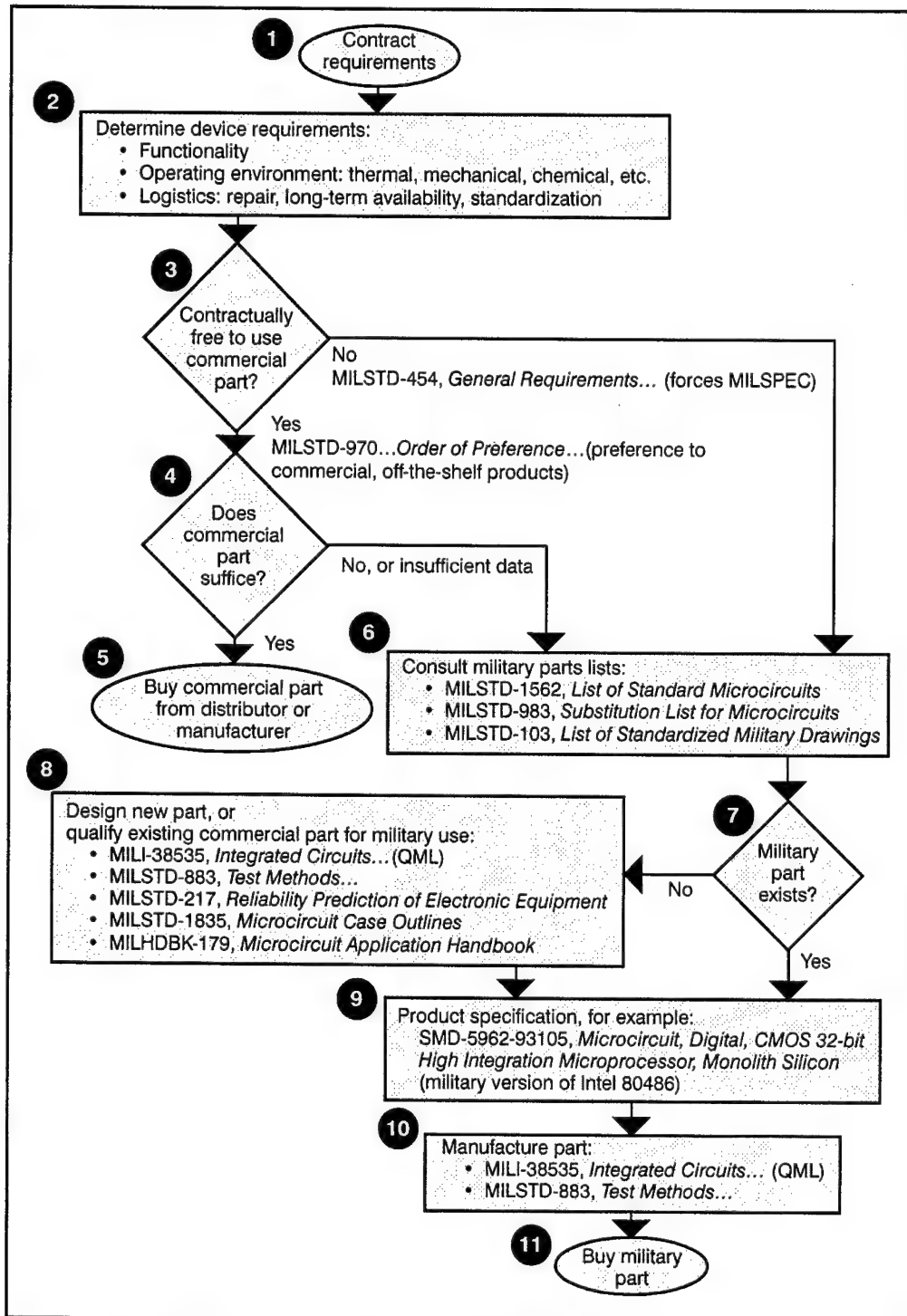


Figure 1. Role of Major MILSPECs in Integrated Circuits Part Selection, Design, and Manufacture

military use (LMI, 1996, pp. 2–10). Military parts lists serve the purpose of controlling the proliferation of parts in the military supply system and its inventory costs. Most important, it lists the parts that are qualified for use. This would include militarized versions of commercial ICs. If a military or commercial part does not exist, the contractor must design a new device or qualify an existing part. A number of MILSPECs may apply that would address the many performance requirements and the tests (electrical, thermal, chemical, and mechanical) that devices must pass (LMI, 1996, pp. 2–12).

Figure 1 demonstrates the benefits of MILSPECs and MILSTDs for most military acquisitions. Specifications and standards describe the performance requirements for a system and how the various components are incorporated into the larger system (form, fit, and function). However, during the 40 years since their inception, there have been increasing problems with the use and content of military specifications.

PROBLEMS WITH MILSPECs AND MILSTDs

Discussion of the MILSPEC problem often confuses two issues. The first is the military's practice of using MILSPECs to buy clearly commercial items: dog combs, tacos, fruitcakes. Applying MILSPECs to these items creates several problems. DoD may have to pay for specialized manufacturing capability to produce an item at a higher price than its commercial counterpart. A specification for white gloves caused one manufacturer to set up a different assembly line with a unit cost of \$32 per pair, while the same manufacturer sells nearly identical gloves commercially for \$20. A related issue in this area is that

needless specifications take away resources from the task of drafting, reviewing, and updating specifications for combat equipment. The second issue involves dual-use materials and components that the military buys. Unlike gloves, which can be bought off-the-shelf, these parts must be tailored for the application. MILSPECs and MILSTDs often make it impossible for commercial companies to do business with the DoD, even though they are technically capable of producing the item. In particular, when the specification tells the contractor how to make the product, the type of quality assurance program, and how to manage the program, it keeps world-class producers away from DoD business (Center for Strategic and International Studies [CSIS], 1993, p. 7).

The problem of MILSPECs and MILSTDs is not with the principle behind them but rather in the way the documents are written and applied, along with the lack of authority and control over the standardization process. In particular, military specifications create a problem when they:

- describe essentially nonmilitary items;
- reference obsolete products and processes;
- detail requirements relating to process rather than performance; and
- differ from common commercial practices and standards (CSIS, 1993, p. 9).

Even with well-established military specifications and standards, problems arise if they are not properly tailored to the system to be acquired. Requirements are put on contracts that add cost without

value and unnecessarily differentiate commercial and military operations (OUSDA&T, 1994, p. 41).

Unnecessary requirements have found their way into DoD contracts for a number of reasons:

"Unnecessary requirements have found their way into DoD contracts for a number of reasons..."

Established practices. Acquisition activities borrow from previous requirements documents, i.e., statements of work or technical specifications, on the assumption that what worked before will work again. This copying from one contract to another brings about inappropriate

specifications and standards that have been canceled or are not cost-effective or necessary for this particular contract.

Comfort level. Requirements are put on contracts out of fear of being accused of mismanagement if they were eliminated.

Excessive referencing. If properly applied, referencing of other specifications and standards can reduce length and complexity. However, there are many references that are inappropriate and excessive for the particular procurement on hand. Where commercial and military standards tend to differ is in the number and types of references. Sometimes this difference is 2 to 1.

Tiering. The referencing of MILSPECs and MILSTDs creates an enormous tiering in which one reference brings about another reference without regard to its need in a contract. This is a particular problem during the production phase of a DoD acquisition.

Improper tailoring. MILSPECs and MILSTDs provide guidance on a variety

of engineering matters depending on the requirement being procured. If the specification or standard is not properly tailored for a particular contract (a whole MILSPEC is called out instead a portion), more requirements than necessary are added, which drives up the cost and may make the item unnecessarily defense-unique (OUSDA&T, 1994, pp. 41-42).

Some feel that military and civilian technologies are inherently different. Military unique systems must push the envelope of performance and endure harsh battlefield environments. This has brought about a belief that has driven the need to have military specifications to ensure performance of military products. Critics of the "uniqueness position" believe that commercial products can be as rugged as those built to MILSPECs and MILSTDs (Office of Technology Assessment, 1989, p. 162). For example, during the Gulf War, many commercial electronic components, from semiconductors to global positioning systems, met or exceeded their military counterparts' performance at a significantly lower price (*Washington Technology*, 1992).

COMMERCIAL AND PERFORMANCE SPECIFICATIONS

WHAT IS A PERFORMANCE SPECIFICATION?

As mentioned earlier, one of the keys to obtaining the latest in electronic technology at the lowest possible cost is through military-commercial market integration. To accomplish this, DoD must use performance specifications, when practicable, in specifying its requirements. The following is the definition of a performance specification from DoD Policy

memo 95-2A issued on March 10, 1995 (Bergmann, 1995):

A performance specification states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics.

A key aspect of a performance specification is that it describes the form, fit, and function of the required product. An example of this is the required size, weight, durability of an item. This allows the contractor to control the production baseline by giving the contractor detailed configuration management authority. By specifying functional requirements, the contractor has greater flexibility to incorporate the latest technology and manufacturing methods in the product (OUSDA&T, 1994, p. 21). This allows for a variety of design and manufacturing solutions that encourage more commercial companies to bid for the work, particularly at the subcontract level.

Aside from allowing greater access to more advanced technology, the use of performance specifications also provides a cost benefit. This comes from greater competition and the fact that commercial companies have already conducted the research and development, tooling, and equipment investment to provide their commercial product. DoD and its prime contractors can leverage on an existing capability for their requirement

(OUSDA&T, 1994, p. 19). Another characteristic of performance specifications is that the contractor picks the test procedure that may offset some of the cost benefits with higher risks. This will be addressed later.

WHAT ARE NONGOVERNMENT STANDARDS?

Standardization in the commercial arena is used for both technical and economic reasons. It simplifies the maintenance and repair of systems, ensures that systems are interoperable with other systems, and often lowers costs through quantity purchasing. In the commercial sector, companies get together to establish minimum performance requirements for their particular industry. There are national standards setting organizations, such as the American National Standards Institute, that set performance standards (i.e., quality and reliability) for the industry. There are international standards, such as the ISO 9000 series for quality assurance (OUSDA&T, 1994, p. 18). However, the initiative to merge the military and the commercial industrial base by encouraging the use of performance and commercial specifications doesn't come without concerns and potential problems.

"Standardization in the commercial arena is used for both technical and economic reasons."

SHORTCOMINGS OF PERFORMANCE AND COMMERCIAL SPECIFICATIONS

As shown above, MILSPECs were established for some very good reasons and their real purpose is to reduce combat risk. So it's important that we examine

the critical and unique aspects of our military systems and how performance specifications can be used. The first area is the environment that military systems operate under. The Air Force and contractors have expressed concerns over using commercial-grade electronic boards on fighter aircraft. People in this community find it acceptable to avoid MILSPECs for the C-130, C-17, or C-5A, where the environment is not harsh, but not for fighter aircraft

"Another area of concern is whether the contractor is capable of meeting the environmental or any other technical performance requirement in testing and evaluation."

(Baker, pp. 6-9). On the latest fighter development program, the F-22, there is some concern over the use of commercial specifications. For the F-22 and other mili-

tary systems there is the harsh environment of heat, cold, and vibration, as well as the military-unique requirement for chemical, nuclear, and biological protection. Circuit boards built to commercial specifications may not survive or protect the system without special insulation that may create a money, schedule, and weight issue for the program (Costigan, 1997).

Another area of concern is whether the contractor is capable of meeting the environmental or any other technical performance requirement in testing and evaluation. Performance specifications may require more testing and evaluation of parts and systems to demonstrate that they meet requirements (OUSDA&T, 1994, p. 19). However, a greater concern is whether or not commercial vendors will allow test information on their parts to be released. Some vendors of commercial hardware

have succeeded in blocking the release of test results on equipment under the threat of lawsuits. A government organization, after carrying out testing of DC-DC converters, was deterred from publishing the results on the World Wide Web as the testers intended. This is a growing design issue with commercial parts. Another issue is the occasional need for more rigorous testing than commercial contractors typically perform. This testing and its results are required before a decision can be made between choosing commercial or MILSPEC parts (Dizard, 1996). When a MILSTD is not used, is there an appropriate nongovernment standard available?

One important part of this reform effort is the replacement of MILSTDs with nongovernment standards. In those situations when commercial companies use a military standardization document, there needs to be a suitable nongovernment standard (Bergmann, 1997). However, since the issuance of the Perry Memo, there have been wholesale cancellations of military standards, without suitable replacements, that serve a useful purpose. A particular concern was the cancellation of military documents that provide the essential information that defines as much as one-third of the parts used on most of the aircraft built. According to the Aerospace Industries Association (AIA), DoD is canceling documents that are the state-of-the-art in commercial practices. The burden then falls on industry to prepare new documents to replace the ones that are canceled (Mabone, 1996). As mentioned earlier, one of the purposes of specifications and standards, both in military and commercial acquisitions, is to help in the logistical support of a system.

Logistical support is probably one of the biggest concerns with the new emphasis on performance specifications, though personnel from the OSD Standardization Program Division believe this has been blown out of proportion (OUSDA&T SPD, 1995). There are those who remember the logistics and maintenance nightmare of programs such as the F-111. Because of this, it is important that supportability is built into the design. A concern exists that if military standards, such as MIL-STD-1388, Logistics Support Analysis, are not requirements on contracts, then proper supportability requirements will not be adequately explained in performance specifications (DiNicola, 1995).

Another characteristic of performance specification is that it leaves the parts or materials selection to the contractor. Concern then arises over whether the spare parts will meet the performance requirements. When addressing this and other logistical support concerns, the reply from the OSD Standardization Program Division is to "place the burden on the contractor" and "make it [logistical requirements] a performance requirement of the contract" (OUSDA&T SPD, 1995, p. 7). This statement does not relieve the concern that people have in this area.

Another important logistical concern with performance specifications is the interface requirement. It is important to know early in the development phase of a program what the support philosophy of the program will be. Then the interface requirements can be defined in the performance specifications. With electronics parts technology, where new designs may be produced every few years, a plan must be developed to handle new parts in the spare parts pipeline (Lightsey, 1996).

IMPLEMENTING MILSPEC REFORM

SERVICE IMPLEMENTATION

A key aspect of MILSPEC reform was to change the way the individual armed services established requirements, in particular specifications and standards, for their solicitations and contracts. The intent of the Perry Memo was to reverse the priority by which military and commercial specifications and standards were used in contract actions. This memo recognized that some MILSPECS and MILSTDs were unique and should be used. The use of military specifications and standards were authorized as a last result, with an appropriate waiver.

Waivers must be approved by the Milestone Decision Authority (MDA) as defined in DoD Instruction 5000.2 (Perry, 1994b). The MDA may be at the OSD level, for large programs designated acquisition category (ACAT)1D, or at the individual armed service level for programs that are not ACAT 1D. Whether the MDA is at the OSD or service level, the key decision point for deciding the use of MILSPECS is with the individual Services. This is because most program offices, which generate the requirement, reside within the Services and all acquisition decisions are either coordinated (thereby strongly influenced) or approved by the Services.

One of the intents behind the Perry Memo was to eliminate a culture surrounding the use MILSPECS and

"It is important to know early in the development phase of a program what the support philosophy of the program will be."

MILSTDs, without the thought of their purpose. However, a culture has developed within the Services that seems to encourage a complete ban of MILSPECS and MILSTDs without regard to their purpose or value. Within the Army, the unwritten rule for program managers was not to have any MILSPECS or MILSTDs if

"However, a culture has developed within the Services that seems to encourage a complete ban of MILSPECS and MILSTDs without regard to their purpose or value."

you wanted your program approved. Program managers wanting to use MILSPECS and MILSTDs, but also wanting their program to get through the approval process,

resorted to writing MILSPECS and MILSTDs in full text without the "MILSPEC label" or putting MILSPECS and MILSTDs on solicitations and contracts for "guidance only" (Defense Systems Management College, 1993–1996). This became the chosen method of program managers throughout the acquisition system of getting a MILSPEC or MILSTD as a requirement and still getting the program through the approval

process. This practice became a concern for the acquisition leadership within DoD and industry. It sent a confusing message to industry (what is the requirement?) and did not promote the cultural change regarding MILSPECS. MDAs were tasked to challenge those programs that excessively list MILSPECS for guidance only (OUSDA&T SPD, 1995, p. 13). The Air Force created requests for proposal (RFP) support teams whose job was to scrub RFPs and ensure that performance-based specifications were used in lieu of MILSPECS. However, many senior acquisition managers questioned the role of these support teams as "facilitators" or as another layer in the review process (Air Force Contracting Conference, 1996). With this senior leadership's emphasis towards performance specifications, what have individual programs done?

EXAMPLES OF MILSPEC REFORM

A number of programs have really scrubbed their requirements. As Table 1 shows, they cover a variety of types of programs in various stages in the acquisition cycle (OUSDA&T, 1996, p. 3). The other Services have made similar efforts

Table 1.
Reduction of Requirements in Some Air Force Programs

Program	Specs and Standards
C-130 Periodic Depot Maintenance	From 200 MILSPECS & STDs to 5
Maintenance Skills Trainer	From 21 MILSPECS & STDs to 0
KC-135 Avionics Upgrade	No MILSPECS or STDs in RFP
Milstar Satellite Communications	From 110 MILSPECS & STDs to 43
Joint Direct Attack Munitions Development	No MILSPECS or STDs in RFP

in reducing the number MILSPECs in their solicitations and contracts.

The initial results of MILSPEC reform have been positive with greater access to commercial technology, improved performance, and more than \$2 billion in anecdotal savings and cost avoidance (OUSDA&T, 1996, p. 19). However, not all of these savings can be attributed to removing MILSPECs. Other acquisition reform initiatives have also contributed to reduced program costs. One of these efforts is reducing the data requirements in contracts that makes up a significant amount of program costs. Another initiative that the Air Force is advocating is having statements of objectives vice statements of work, to get away from telling the contractor "how to" make a product or perform a service. The Services, with support from DoD, are reducing costs by promising contractors a stable production quantity through multiyear and other contract incentives. Additionally, DoD cannot lose sight of one of the main goals behind MILSPEC reform, which is easier access to state-of-art technology. This reform is not limited to the actions of program offices.

DOCUMENT INFRASTRUCTURE

An important part of MILSPEC reform will be to implement standardization document improvements. This is a challenging task for DoD, involving many documents and much preparation: the Services, Defense Logistics Agency, industry, and other government agencies all are involved. DoD intends to have a document infrastructure based on performance specifications and interface standards for weapon systems and military-unique items of supply; commercial item descriptions

and nongovernment standards for commercial items and processes; and a library of guidance handbooks that contain lessons learned and offer known technical solutions (OUSDA&T, 1996, p. 10). This will be the key effort for an effective and permanent MILSPEC reform. With more than 30,000 MILSPECs and MILSTDs, and the many preparing activities, this will not be an easy task and will require an active central effort led by DoD.

The Standardization Program Division of the Acquisition Practices Directorate of OSD was tasked to lead this effort; one of its first steps was to establish a communication forum. A MILSPEC Reform Home page was established on the World Wide Web and was among the top 5 percent of the most frequently accessed home pages on the Internet. The Home page included policy and guidance memos, questions and answers on MILSPEC reform, status reports on the top 100 cost driver documents, lists of proposed canceled documents, lists of recently canceled documents, the *Standardization Newsletter*, and hot links to other related homepages (OUSDA&T, 1996, p. 11).

While this has been a positive effort, there is still a more challenging task of standardizing the way the Services are handling the cancellation and waiver process of MILSPECs. Each Service is deciding which MILSPECs are allowed without a waiver and which ones cannot

"Another initiative that the Air Force is advocating is having statements of objectives vice statements of work, to get away from telling the contractor 'how to' make a product or perform a service."

be used at all. An example of this is with MILSTD-1388, Logistics Support Analysis, which is allowed by one Service but not another. This inconsistency will cause problems in joint programs where systems will be fielded by the individual Services and in contractor facilities where one contractor could have two specifications for a process or processes. This situation conflicts with the goal of MILSPEC reform (Delorie, 1996). Another important player in MILSPEC reform is industry.

INDUSTRY'S ROLE

The first key aspect that industry played in this reform effort was the keeper of the nongovernment standards. An example of this was the Aerospace Industry Association (AIA). AIA's National Aerospace Standards has been a part of worldwide aerospace production since 1940. They define a large portion of the parts for com-

mercial and tactical fighter aircraft. AIA has the largest collection of standards of any trade association and defines more national stock numbers than any other nongovernment agency (AIA Newsletter, 1996). Industry

"DoD's MILSPEC reform appears to be achieving its stated objective: reducing acquisition costs, enabling greater access to state-of-the-art technology, and integrating the defense and commercial market places."

must have a continual dialog with DoD regarding the proper documentation to use as requirements for the acquisition of its weapon systems. As outlined above, it must complain when MILSPECs are canceled without a proper commercial

replacement. During the solicitation process, it must recommend the use of MILSPECs when it would be the best way to acquire a system. As a united front, it must insist that test results of commercial parts or components are published to allow its use for military systems (*Military & Aerospace Electronics Newsletter*, 1996).

WHERE DO WE GO FROM HERE?

BENEFITS AND RISKS

DoD's MILSPEC reform appears to be achieving its stated objective: reducing acquisition costs, enabling greater access to state-of-the-art technology, and integrating the defense and commercial market places. The benefits will be more dramatic with electronics parts, as they make up a large part of our weapon system and their technology is growing at a rapid pace. However, the key word is "appears," because this initiative is still in its early stages. Only over time, as new systems that are using performance specifications instead of MILSPECs are fielded, will the effectiveness of this reform be measured. Perry's June 29, 1994, memo provided the proper framework for change within the acquisition community for both the government and industry. This change will encourage those developing requirements to use all the specifications available, from performance specifications to MILSPECs, in acquiring weapon systems. Emphasis on government specifications was turned around, with MILSPECs going from the preferred to the least preferred specification method. However, MILSPECs were not eliminated with the Perry Memo, but that is not the attitude that Service implementers had.

The way the Perry Memo was implemented by the Services has brought about some unnecessary risk to DoD's acquisition. By seeming to say "do not bring a MILSPEC in for a waiver," the senior leadership has forced program managers to abandon MILSPECs without the proper performance or reliability knowledge of appropriate performance or commercial specifications. It has also created a situation of gaming the approval process by putting MILSPECs on solicitations and contracts as guidance documents or in full text. Both practices confuse industry. The other risk is not having performance and reliability data on commercial parts in the harsh environment under which military weapons operate. With the freedom of design of performance requirements, it is more critical to have the right interface specifications on our complex weapon systems. To reduce this risk, there must be a continued emphasis on research, training, metrics, and flexibility regarding specifications.

RESEARCH

DoD and industry must continue their research on the performance and reliability of commercial parts. This includes testing under the harsh conditions that are standard for military systems and also the interface requirements of these parts into military systems. Industry must be willing to open up its test data to others to enable informed decisions to be made regarding contract requirements. This research will require funding by DoD in a time of declining budgets. DoD must be careful in not counting its savings from MILSPEC reform too early and set aside some funding for required research on commercial parts. Prime contractors must

have incentives to conduct performance research and conduct tests on commercial parts to determine how they will interface with military systems. As critical as research is to the ultimate success of MILSPEC reform, the DoD must consider the critical area of training if it hopes to succeed.

TRAINING

With the implementation of MILSPEC reform, personnel who had to write requirements documents were left in a difficult situation. Many of these personnel, both in industry and DoD, were trained and had the experience of using MILSPECs in calling out requirements for an acquisition. As an instructor at the Defense Systems Management College, I saw that a number of my students were concerned did not feel that they had the experience to write performance specifications. Training must be accomplished using all available avenues: Internet, classroom, conferences, and video. The Standardization Program

Office must be the centerpiece to ensure that adequate information is available for all personnel involved in developing

requirements documentation. However, only through proper metrics will we know how effective the MILSPEC reform has been.

METRICS

In the current acquisition reform environment, the only metrics that I am aware of are the counting of MILSPEC documents

"DoD and industry must continue their research on the performance and reliability of commercial parts."

and projected cost savings. This does not provide a measure of the effectiveness of utilizing performance and commercial specifications. A more appropriate measurement would be to compare the performance and reliability of the parts for systems acquired by using performance specifications instead of MILSPECS. Another metric that could be used to measure cost as a comparison is the total life cycle cost of a system. This would provide a measurement of how cost effective commercial parts are in not only in development and production, but the more important area of operational and support costs.

FLEXIBILITY OF THE SPECIFICATION USED

In order to be both effective and efficient, the Services must follow the direction provided under the Perry Memo. The intent of MILSPEC reform was to put an emphasis on performance specifications over MILSPECS, not eliminating their use. However, the overzealous implementation

practices of the Services has created an environment of eliminating MILSPECS completely. This practice has to stop before too many weapon systems are developed without the proper knowledge of the performance specifications being put on contracts. Specifications and standards are the most important part of weapon system development. Because they represent key technical decisions, specification decisions should be made by the program team. The program manager, who is responsible for the success of the program, should have the authority to make specification decisions with the approval of the Milestone Approval Authority. There should not be the sort of inflexibility (i.e., "do not bring us a program with MILSPECS") that currently characterizes the environment in the Services. The Perry Memo set the stage for acquisition reform. Now it must be properly managed through research, training, metrics, and flexibility in the type of specifications used to acquire effective weapon systems.

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GENERATING NEEDED MODERNIZATION FUNDS STREAMLINING THE BUREAUCRACY —NOT OUTSOURCING AND PRIVATIZING— IS THE BEST SOLUTION

Dr. Jan P. Muczyk

The Department of Defense (DoD) budget, in real dollars, has decreased for a dozen years or so, and will likely continue to do so. Since all the funds necessary for warfighting asset modernization will not come from Congress, DoD must free up existing funds for reallocation to its modernization program. So far, much reliance has been placed on privatization and outsourcing as ways of releasing large sums of money. But it is highly unlikely that these instrumentalities are up to the task, and other sources must shoulder a large part of the load. Although eliminating duplication of mission and roles is briefly addressed, most of the effort is now devoted to streamlining bureaucracy because it, as an inordinate proportion of the DoD budget, is the dark alley in which the gold watch is lost.

As long as the Soviet Empire threatened our way of life, and China attempted to subvert third-world nations with communist ideology, elected officials had little difficulty passing large defense budgets. Neutralizing the military threat posed by the Soviet Union and China (effectiveness) was the central issue, whereas cost of the necessary weapons (efficiency) was secondary.

With the Soviet Union fragmented, China looking inward, and a national consensus to balance the federal budget formed, defense appropriations must now compete with salient domestic problems as they have not done for half a century. At the same time the defense establishment is feeling the budget squeeze, many of the existing weapons systems are reaching the end of their projected useful life.

WHERE FOLKS ARE LOOKING FOR THE GOLD WATCH

In order to pay for a new generation of weapon systems, elected officials and defense department leaders are looking to efficiencies produced by outsourcing and privatization as partial, but significant, sources of asset modernization funds (Muczyk, 1997). Pentagon estimates range between \$14 and \$30 billion (Weinberger and Schweizer, 1997). This strategy is a bit reminiscent of a drunk searching for a gold watch (lost in a dark alley) in the kitchen, because that is where the light is turned on. The huge sums that are needed for the next generation of high-tech weapon systems simply are not to be found in the privatization and outsourcing alternatives—the lighted kitchen, if you will.

Efficiencies are obtained by exposing an economic activity to the rigors of the marketplace created by intense competition which, in conjunction with the profit motive, is the sine qua non of efficiency. If the consolidation in the defense sector continues, at best the military will be faced with doing business with oligopolies, if not outright monopolies. And private oligopolists or monopolists are no better than public ones.

Once a monopolist attracts business from the government by low-balling, and

the organic capability of the government is dismembered, then the sole supplier can exact the monopolistic thereafter. The situation is exacerbated by the fact that the Department of Defense (DoD) no longer buys anything in the large quantities that were typical of purchases during the Cold War, thereby losing much of its leverage over contractors (Wayne, 1998).

Another reason for expecting smaller savings relates to the bureaucratic quagmire imposed on private sector companies doing business with DoD, acquisition reform to date notwithstanding. Some corporations, probably the more efficient, actually refuse DoD business rather than put up with all the bureaucratic hurdles.

Much of the potential savings can only come from reductions in manpower. But job preservation is frequently the paramount consideration as far as elected officials are concerned when it comes to base realignment and closure, as well as privatization and outsourcing. Therefore, the negotiated settlements associated with privatization and outsourcing efforts do not reduce payrolls enough to make that much of a difference. Current resistance by elected officials to further base closings and realignment is a case in point. That is not to say that impressive examples of efficiencies are unavailable, especially of the anecdotal variety; but the jury is still

Jan P. Muczyk (D.B.A., University of Maryland) is dean of the Graduate School of Logistics and Acquisition Management at the Air Force Institute of Technology. Before coming to AFIT in 1995, Dr. Muczyk spent 22 years at Cleveland State University. He served in a number of assignments there including interim dean of the College of Business Administration, senior vice president for resource planning and campus operations, and executive assistant to the president and associate provost. In addition to co-authoring a management book, Dr. Muczyk has published numerous articles and served as a consultant to a variety of public and private organizations.

out on the overall economic impact of the privatization and outsourcing initiatives (Jones, 1997).

A variant of the job preservation strategy by elected officials takes the form of statutory restrictions and regulatory impediments. Public Law 10 United States Code 2466 (which establishes the 60:40 depot maintenance split) and OMB circular A76 (which mandates public and private competitions) are excellent examples. The 1996 "Report of the Defense Science Board Task Force on Outsourcing and Privatization" identifies all of the important ones (Defense Science Board, 1996).

Lastly, the penchant for managing just about everything contractors and subcontractors do negates whatever savings might occur from private sector initiatives by precluding the reduction of the DoD infrastructure.

WHERE THE GOLD WATCH IS ACTUALLY LOST

The gold watch (large sums of money) happens to be lost in "mission and roles" and in the "Byzantine bureaucracy" that consumes such a high proportion of scarce resources—the dark alley, so to speak. Of course it is easier to look where the light is, but the easy strategy is not going to produce the desired results.

The discussion of "missions and roles" shall be left to others. Suffice it to say at this juncture that bureaucratic mind-sets developed during the Cold War continue to drive defense policies and weapon acquisition strategies. The latest Quadrennial Defense Review (QDR) proposes a smaller version of the same kind of military that existed during the Cold War—

with its emphasis on traditional big-ticket items such as combat planes, aircraft carriers, main battle tanks, and a long, impressive logistics chain. Responding to "asymmetric" threats with new technologies and an appropriately realigned but smaller configuration of forces emphasizing joint war fighting capability is still receiving more lip service than anything else.

However, it is unlikely that this country, in the absence of a major military threat like the Soviet Union, will continue to fund the kind of redundancy that currently exists in the armed forces, and that may have been

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appropriate when the Soviet Union and China posed real threats to U.S. interests. (For example, not only does the Navy have an air force and an army [the Marines], the Navy's army has its own air force as well. Incidentally, the Army has its air force [and a large one at that, when helicopters are included] and navy [Corps of Engineers] too.) I do, however, intend to discuss federal bureaucracy at some length.

FORCES THAT LEAD TO BUREAUCRACY

The equivalent on the bureaucratic front to the elimination of duplication in mission and roles, in a nutshell, is the cessation of all activities not central or absolutely essential to the mission of defending this nation (rather than privatizing or outsourcing them). Simply put, if the activity is not critical to the mission, just

don't do it. Historically, war-fighting strength to support, or tooth-to-tail ratio, was roughly 50:50. Currently, it is estimated that about 30 percent of the defense budget is devoted to war-fighting (tooth) whereas approximately 70 percent of it is devoted to support functions (tail). Gansler (1998), Under Secretary of Defense for Acquisition and Technology, estimates the "tail" to be around 65 percent. Even though we factor in the reality that some of the "tail" is really the "jawbone" that anchors the "teeth," the tooth-to-tail ratio is still out of kilter (McInerney and Weiss, 1997).

PARKINSON'S LAW AND BUREAUCRACY

C. Northcote Parkinson (1957) observed during World War II that work expands to fill the time allotted for its completion. Every time some of his civilian employees in the British Admiralty Office were drafted into the armed services, the remaining ones accomplished the mission just as well. Parkinson eventually realized that this was so because of

"Currently, it is estimated that about 30 percent of the defense budget is devoted to war-fighting (tooth) whereas approximately 70 percent of it is devoted to support functions (tail)."

the natural tendency to build empires. Prestige and compensation of administrators in bureaucratic organizations are determined, in part, on the basis of how many subordinates

they employ and the size of their budgets. Therefore, they are motivated to hire more employees than they absolutely need and to increase their budget by the largest amount they can. These observations also

led Parkinson to conclude that: "The number of subordinates increases at a fixed rate regardless of the amount of work produced" (Weinberger and Schweitzer, 1997).

In all likelihood, the truculent turf wars that are constantly fought in bureaucracies, especially during periods of budgetary decline, are about size of the respective empires and not mission essentiality. Since most workers will not just stand around for a variety of reasons, they invent activities to keep busy—in other words, occupational hobbies. Hence, the remaining employees reporting to Parkinson had no choice but to abandon the occupational hobbies and focus on activities that were essential to the mission. The exogenous impetus for efficiency in the private sector—that is, the need to make a profit or go out of business—is missing in government bureaucracies (Katz and Kahn, 1978).

GOAL DISPLACEMENT AND BUREAUCRACY

Students of bureaucracy have observed that the displacement of goals by the means of their attainment is a common occurrence in bureaucracies, and contributes to inefficiency almost as much as Parkinson's law. In a dynamic and fluid environment, goals and objectives that once made sense but have become obsolete are frequently superseded by more appropriate goals and objectives. Yet, the means by which the replaced goals have been attained have become institutionalized and occupy the time of organizational members, when they should have been discarded as well. To wit, when organizational members in a bureaucratic organization are asked: "Why do you do something this way?" They frequently answer:

"We have always done it this way." The preoccupation in bureaucracies is with form not substance, or with the means, not end goals (Katz and Kahn, 1978).

It is estimated that the Pentagon spends \$8.50 to process a paycheck, when the private-sector performs the same task for \$1.00. In 1993, the Pentagon spent \$1 billion to process \$3.5 billion in travel expenses. The Defense Logistics Agency has reduced its wholesale medical inventory by 60 percent—\$380 million—since 1992 by using commercial distribution methods rather than DoD warehouses to distribute medical supplies. This was only possible because many DoD employees had been engaged in numerous superfluous tasks and activities (McInerney and Weiss, 1997; Muczyk, 1997).

DIVISION OF LABOR AND SPECIALIZATION OF TASK AND BUREAUCRACY

Clearly, the application of Adam Smith's principle of "division of labor and specialization of task" has played a large part in the ability of industrialized societies to produce a veritable cornucopia of goods and services at affordable prices. This principle, however, may have been taken to extremes. There are now specialists for the narrowest tasks and a surfeit of staff departments, resulting in excess employment and substantial inefficiencies due to the coordination problems and "red tape" associated with so many folks making demands of all sorts. In addition, the boredom and monotony that result from excessive division of labor and specialization of task frequently create serious motivational problems for the kind of employees who thrive on interesting and challenging work (Dunham and Pierce, 1989).

One management scholar observes that in U.S. organizations, "Over the past several decades, fully 10 times as many white collar jobs have been added to the workforce as line jobs." This phenomenon has been referred to as "white collar bloat." This individual goes on to say: "The important point is that once a new function is established, it is rarely disbanded; its original premise is rarely considered" (Davis, 1991).

Practically every executive in DoD has an executive of-

"There are now specialists for the narrowest tasks and a surfeit of staff departments, resulting in excess employment and substantial inefficiencies."

ficer, a secretary, and one or more clerks. Indubitably, much of their time and effort are devoted to bureaucratic requirements that can be eliminated

without causing any damage, thereby either reducing the force structure or assigning these persons to essential tasks. For example, whereas the number of Army divisions has been reduced from 18 to 10, active fighter wings from 24 to 13, and ballistic-missile subs from 34 to 14, and uniformed personnel from 2.1 million to fewer than 1.5 million, there has been a simultaneous 25 percent increase in the Pentagon's senior civilian leadership. Stated another way, the U.S. force structure and budget have declined by about a third from their peak levels; the infrastructure, however, has declined about 18 percent. It is also interesting to note that after the impressive reductions, the military is asking for dozens of additional flag officers. Clearly, much work remains to be done to bring infrastructure in line with

combat capability (McInerney and Weiss, 1997; Muczyk, 1997).

Of course, most people employed in jobs that are marginal or unrelated to the principal mission of the organization are not about to offer up them up in the interest of organizational efficiency. In fact, they will not even admit that their jobs can

"There must be a veritable army of federal bureaucrats responsible for nothing but briefings created on Power Point."

be eliminated without much harm to the organization. On the contrary, they will in all likelihood try to demonstrate to everyone just

how indispensable their jobs really are by inventing unnecessary processes and procedures, all involving many needless forms for others to fill out. In like manner, these folks schedule meetings that consume a great deal of valuable time and accomplish very little in return. Many of these meetings take the form of briefings. There must be a veritable army of federal bureaucrats responsible for nothing but briefings created on Power Point. In fact, if the next war is to be fought with Power Point and forms, the United States will be invincible. Once vested interests in make-work activities are created, it behooves job occupants to corrupt best business practices in the interest of job security.

CURES THAT ARE WORSE THAN THE DISEASE

The typical bureaucratic response to an employee indiscretion is to put in place a system that makes it next to impossible to commit that offense again, without weighing the cost of the impropriety to the organization versus the cost and benefit of the control system. The best business

practice, as far as who signs travel forms is concerned, is one signature—that of the employee doing the traveling. Certainly, the travel forms are audited, and the occasional culprit appropriately disciplined. Yet, such a system is far less expensive than involving two or three individuals in the approval process without any material harm accruing to the organization. When several violations are observed by high ranking officials, everyone receives training, even though there is no systemic problem. Obviously, the cumulative cost of all such excessive safeguards amounts to a fortune.

Another example of a cure that turned out worse than the disease is the concept of "different color" money. In other words, specific accounts can only be used for designated purposes, lest money intended for one purpose be used for another purpose, regardless of how critical it might be. Certainly, some "fencing" of funds is desirable—such as a proscription against the use of capital funds for operating purposes—but many such restrictions create their own oversight bureaucracy, which prevents the kind of discretion so vital to the efficient management of scarce resources. In like manner, preventing organizational units from carrying unspent funds from one fiscal year to the next makes it difficult to spend money wisely, and leads to unintended and undesirable consequences at the end of the fiscal year.

THE BUREAUCRATIC MIND-SET

Unfortunately, the bureaucratic mind-set is contagious, and the principal transmission mechanism is the reward system through which bureaucratic behavior is reinforced by the entire gamut of rewards, while efficiency and innovation are

conditioned out of employees through the full panoply of sanctions, with role modeling (new employees emulating veteran employees), professional continuing education courses (focusing on extant ways of doing things), and inertia completing the bureaucratization process. Civil Service and labor unions add to the futility of bureaucratic reforms since, much like academic tenure, they are cures that have become much worse than the diseases they were intended to combat.

BOUNDED DISCRETION

Simon's concept of "bounded rationality" (1957) shed considerable light on why managerial decisions do not necessarily conform to the predictions of the rational economic model. Whereas Simon focused on imperfect information as the primary reason why managers "satisfice" rather than optimize, he ignored the fact that typically the devil is in the implementation. Hence, in addition to "bounded rationality," there exists an equally important impediment to organizational efficiency that I call "bounded discretion," which limits the implementation of sound management decisions. Bounded discretion is caused by the sum total of all the bureaupathologies, which deflect energy and effort from those activities that really matter. Bureaupathologies reduce managerial degrees of freedom and shrink the tradeoff space. In other words, managerial discretion is severely restricted by the organizational arteriosclerosis that bureaucracy induces in organizations that it infects. It would not be much of a hyperbole to suggest that the system is choking on its own bureaucracy. I shall employ the mallard paradox to bring home the point.

When one observes the feet of a swimming duck, they are paddling frenetically, but the body of the duck is not moving very far. When a casual observer walks through a bureaucracy, he or she may at times observe employees working feverishly. Yet, not much progress appears to be made at the

end of the week, the month, or the year. How do we explain this paradox? Well, the observer is watching the organizational feet.

That is, all the folks who have "rice bowls" that are either unrelated or marginally related to the mission of the organization assign urgent tasks to everyone. In this manner, they demonstrate that they are earning their keep. Since these assignments are occupational hobbies and by-and-large are inconsequential vis-à-vis the mission (the body of the duck), the organization winds up making very little real progress.

"Bounded discretion is caused by the sum total of all the bureaupathologies, which deflect energy and effort from those activities that really matter."

WORLD WAR II EXPERIENCE WITH BUREAUCRACIES

The history of this country has been quite consistent with regard to maintaining peacetime military presence. Once armed conflict ended, the United States demobilized, and consequently was unprepared for the next war. Unlike other wars, however, World War II was followed by the Cold War, which turned out to be the functional equivalent of a shooting war so far as defense expenditures and the size of the force structure were concerned. In light of this history, World War II also caught the United States unprepared.

"While most informed individuals acknowledge and applaud the latest revolution in military affairs, the need to create a concomitant revolution in management affairs draws sparse applause."

Therefore, we had to ramp up for war on two fronts at breakneck speed. Since we lacked the time in many instances to create

large bureaucracies in a systematic fashion, perforce small jury-rigged organizations were fashioned to do the job. Fortunately, it was the lean organizations that produced the most impressive results,

with "Lend-Lease" serving as perhaps the best example. That is to say, the World War II experience buttresses the position of the "minimalist bureaucracy" school of thought (Gropman, 1997).

SALIENCY OF SOCIAL TECHNOLOGY

It is common when thinking of technology to overlook what is referred to as "social or management technology." Whereas physical technology is the realm of Thomas Edison and his laboratory, management technology relates to the organizational patterns, financing alternatives, and management systems, processes, and procedures that hold an institution together and permit it to function efficiently or otherwise. While most informed individuals acknowledge and applaud the latest revolution in military affairs, the need to create a concomitant revolution in management affairs draws sparse applause.

For example, Japanese management technology quickly converts worldwide

innovation into high-quality industrial and consumer goods at competitive prices and delivers them to the marketplace on a timely basis. It is this ability that gives the Japanese the illusion of being more innovative on the physical technology frontier than they actually are, and is largely responsible for the "Japanese Economic Miracle." It is this "leading edge" management technology that makes it possible to exploit physical technology (Muczyk, 1990).

In fact, it was largely the Japanese management challenge that compelled U.S. firms to become efficient or file for bankruptcy. The opposite of "leading-edge" management technology, however, is bureaucracy. Short of exposing activities currently performed by government bureaucracies to the rigors of intense competition, is there anything that can be done to make bureaucratic organizations less so? The short answer is that the best cure for bureaupathologies is spirited competition and lots of it. Nothing comes in as a close second. Yet, in the absence of competition, some steps can be taken to make organizations more efficient, if the "managerial will" exists.

RE-ENGINEERING ORGANIZATIONS

The word "re-engineering" happens to be in vogue, as we well know. Re-engineering means excising those activities that are either unrelated or marginally related to the central mission (occupational hobbies), removing redundancies, and creating or refining processes through which mission relevant goals and objectives are attained in an efficient and effective manner. Re-engineering requires evaluating

the value chain and eliminating or reducing components that either add no value or very little, whereas retaining and even enhancing those that add considerable value. Downsizing, on the other hand, may or may not be synonymous with re-engineering; depending on whether or not the aforementioned issues were considered before manpower reductions were made (Muczyk, 1997). Critical to all re-engineering efforts are the elements discussed below.

A good place to begin re-engineering efforts is activity-based costing (ABC)—a systematic method for assigning costs to business activities. First, a reasonable number of business activities needs to be defined, and all the costs associated with each activity need to be assigned to the appropriate activity. Once this much has been accomplished, the activities with their associated costs can be allocated to products, processes, customers, or vendors. Next, activities need to be assigned priority on the basis of cost, with the most expensive activity receiving top priority for scrutiny with respect to redundancy, relevancy, and criticality. Last, whenever appropriate, the unnecessary or marginal activities are eliminated.

Another worthwhile approach involves benchmarking efficient and effective organizations. This is a particularly productive way of gauging the appropriate size of headquarters staffs, but could be applied to rightsizing practically any functional area.

Part-and-parcel of re-engineering is tradeoff analysis. Since the day and age when nothing was too good for defense is long gone, we must now frequently decide what it is that we will give up in return for getting or keeping something; and whether

the exchange is worthwhile with respect to the central mission of the organization. The decision sciences, including modeling and simulation, have evolved to the point where defining the tradeoff space and making informed choices within it can now be made with greater confidence; and we are obliged to use state-of-the-art methodology to assist us with difficult decisions.

In short, it is through tradeoff analysis and cost-benefit analysis that we begin building value chains. While we cannot become obsessed with efficiency at the expense of effectiveness in a variety of risk environments, whenever practicable we must insist that all technology, processes, and procedures still “buy” their way into the organization in terms of reducing the total cost of doing business. The argument

“Individuals who are serious about re-engineering should avoid prematurely imposing procrustean solutions and methodology.”

that not everything can be precisely quantified should not be accepted as an excuse for forgoing rigorous tradeoff analysis wherever applicable.

Individuals who are serious about re-engineering should avoid prematurely imposing procrustean solutions and methodology. There is merit, especially during the nascent stage of any movement, in letting 100,000 flowers bloom, then replanting only the most beautiful. To make this happen, mechanisms need to be created for collecting and promoting successful prototypes.

IDENTIFY WHAT IS IMPORTANT

Re-engineering should begin with the identification of what is important. To paraphrase the Cheshire Cat in *Alice In Wonderland*: "If you do not know where you are going, any road will take you there." To assist us in this vital undertak-

"It has been estimated that 30 percent of private sector workers' time was wasted because of work scheduling problems alone."

ing, we need to heed the counsel of a brilliant mathematician, economist, and sociologist, Vilfredo Pareto, who observed some time ago that many phe-

nomena are distributed in accordance with the 80:20 rule; a discovery as significant as Gauss's normal curve. The 80:20 rule applies to sales, profits, problems, management activities, organizational goals, etc. Frequently, 80 percent of sales come from 20 percent of the customers; 80 percent of the profits from 20 percent of the product line, 80 percent of the problems from 20 percent of the employees, and so forth. Unfortunately, many, if not most organizations, devote 80 percent of their time, effort, and money to the 80 percent that does not matter very much instead of the 20 percent that makes most of the difference (Kreitner, 1995).

In the inventory management sphere, Pareto's 80:20 rule is known as "ABC analysis." Since typically about 20 percent of the items account for 80 percent of the cost or activity (and 5 percent of the inventory is often responsible for half of the cost or activity), these items receive special attention. The remaining 80 percent are handled in a routine manner (Muczyk, 1997).

With respect to planning, the 20 percent of the most important goals are called "breakout" goals. It is the attainment of "breakout" goals that provides the quantum leap to the next plateau of an organization's vision.

Pareto's 80:20 rule is also instructive with respect to which contractor activities need to be managed. The decision rule may go something like this: Manage the most important 20 percent, track the next 30 percent, and forget the rest. In other words, focus on the results, not the means. That is to say, institute meaningful rewards for those contractors who deliver a product or service on time, on budget, and within specifications, and impose significant sanctions for those that do not (Fox, 1997).

CONTINUALLY IMPROVE AND REFINE SPECIFIC MANAGEMENT PRACTICES AND PROCEDURES

It has been estimated that 30 percent of private sector workers' time gets wasted because of work scheduling problems alone. The situation is probably exacerbated in the public sector because vigilance with respect to best practices is a survival imperative in a competitive environment, whereas efficiency is an option in the absence of competition. Consequently, preserving best business practices in their original form is a continuous challenge that requires unrelenting management attention. After all, how can employees take their jobs seriously when they observe on a daily basis management's indifference to inefficiency? The Japanese call this process "kaizen," which means improving the overall system by constantly improving the details (Muczyk and Hastings, 1985). In order to clarify shared tasks between departments, organizations

should consider such aides as: the responsibility chart; process management; and cross-functional teams. Important ideas frequently lead to significant consequences. We can initiate the chain reaction by sending military and civilian DoD employees to quality, focused, technical master degree programs for cutting-edge ideas and best practices (Davis, 1991; Kankey, Muczyk, and Ely 1997).

RETHINK THE ROLE AND SIZE OF STAFF DEPARTMENTS

The purpose of staff departments is to serve line departments, not the other way around. F. Kenneth Iverson, president and CEO of Nucor Corp., the most successful steel firm in the United States, takes the following position vis-à-vis staff departments: "We keep people at our plants where the day-to-day decisions are made. There is no need for a large support staff." Benchmarking efficient private sector corporations is an excellent way of emulating this "best practice" (Muczyk and Hastings, 1985).

Administrators should abandon the habit of using staff departments as their eyes and ears. Once staff personnel become perceived by other organizational members as the "Organizational Gestapo," they will no longer be viewed as a valuable source of help, thereby negating their most important potential contribution, which is advice, consul, and assistance. Equally important, the organization will not need as many staff department and personnel if they do not use staff as an integral part of the organizational control system.

Some private sector organizations require staff departments to charge internal users directly for the services they receive.

Under this arrangement, a staff department is expected to recover its own operating costs by billing other organizational units for services provided. Since staff departments must live within their budget, they must downsize if their services are not used enough. Such a scheme works even better if organizational units possess the option to purchase services on the open market, if they receive better value (Davis, 1991).

DE-LAYER HIERARCHIES

Bureaucratic organizations subscribe to the classical management principle of narrow span of control, which states that managers above the first level of supervision should restrict themselves to four to eight subordinates (other managers). Such a span of management forces a tall organizational structure with many layers of management. The importance of position in the bureaucratic structure exacerbates the tendency to build organizations with unnecessary levels of management (Muczyk and Hastings, 1985).

In a typical Japanese factory, foremen report directly to plant managers. Foremen in a typical U.S. factory have three additional layers of management that are expensive and create bureaucratic rigidity. At well-run organizations, such as Nucor, there are only five levels of workers—the president, seven vice presidents, department managers, supervisors, and production workers. While tall organizational structures afford more promotional opportunities and more time available to each

"Administrators should abandon the habit of using staff departments as their eyes and ears."

subordinate from the superior, the price to be paid for these positive features is considerable, not the least of which is the cost associated with unnecessary managers (Muczyk and Hastings, 1985).

Furthermore, reducing management layers by broadening the span of control forces decision making down to the lowest levels that possess the expertise to make them, thereby empowering the workforce. After all, it is through empowerment that many employees become enthusiastic stakeholders in the organization's mission and goals, and it is the same empowerment that makes effective implementation possible (Stone, 1993).

EMPLOY NETWORK ORGANIZATIONS

In light of the DoD emphasis on privatization and outsourcing, it would be eminently sensible for senior DoD leadership to consider heavier reliance on network forms of organizing. Network organizations differ from previous organizational structures in the following ways:

- Network organizations define their core competence, and contract the remaining functions. That is, they use the combined assets of several firms located at various points along the value chain.
- Network organizations place greater reliance on market mechanisms than administrative processes to regulate resource flows. These are not, however, "at arm's length" relationships. The interdependence, in fact, resembles the Japanese "keiretsu."
- Network organizations expect a proactive role among participants that

enhances the final product or service rather than just fulfilling a contract to the letter. Those members of the network that are reluctant to go the extra mile lose their position (Miles and Snow, 1992).

REWARD WHAT IS IMPORTANT

Working hard and smart is not part of the human condition. The path of least resistance is. However, employees in an instrumental culture such as those that exist in the United States will concentrate on those activities and outcomes that are measured and rewarded. If an organization is serious about reducing bureaucracy, it must measure the important activities and outcomes, and reward in a significant way those individuals who perform them well. The best way to preserve the status quo is to measure everything, as is frequently done now, and to reward all outcomes and activities the same. Clearly, Pareto's 80:20 rule is a very useful guide in this respect (Muczyk, 1988).

WHAT THE DoD IS DOING ABOUT BUREAUCRACY

In recognition of the top-heavy bureaucracy, U.S. Defense Secretary William Cohen plans to eliminate several high-level policy and command and control offices and more than 30,000 workers from defense agencies by the year 2000. How well this "reform" will turn out will depend on which of the approximately 157,000 persons, as well as what functions, will actually be cut. If the people and functions that are marginal to the defense mission are cut, then the results will be beneficial. But if the people and

functions that are cut are the ones that add a great deal to the value chain, then the defense capability could be compromised (Holzer, 1997). Clearly, it will take bold and visionary leadership to make the right choices and ensure effective implementation.

This is the leadership challenge of our time.

CONCLUSION

Of all the industrialized economies at the end of World War II, the only one that escaped widespread destruction was that of the United States; and it took approximately a quarter of a century for the industrialized economies to rebuild and for emerging ones to join the world economy. Until reconstruction was completed in the early 1970s, U.S. firms had either oligopolistic or monopolistic power in the international marketplace.

In the absence of competition, U.S. companies had become bloated and inefficient bureaucracies. Once global competition manifested itself on a large scale, these firms either slimmed down in a hurry and at the same time adopted best global practices, or went belly up. In the first round or two, firms eliminated unnecessary production and clerical workers and introduced new technology; but in later rounds, it was middle managers' and staff professionals' turn to be terminated. Competition gave U.S. firms no other choice.

The same forces that created bloated private sector enterprises between 1945 and the early 1970s had a much longer time to bureaucratize organizations that were insulated from competition all along—that is, public sector organizations.

Whenever possible, it is recommended that activities currently performed by government organizations be exposed to the rigors of the marketplace through privatization or outsourcing. In those instances where the preferred solution is not available, recommendations are presented for streamlining organizations in the interest of efficiency, without sacrificing effectiveness. Both strategies need to be pursued aggressively to free up the prodigious sums of money needed for war fighting asset modernization.

It is becoming obvious to most people associated with the U.S. armed services that the up-tempo pace cannot be sustained indefinitely; and the situation is more likely to get worse before getting better, unless something is done that does not require additional resources. Consequently, the cessation of activities that are marginal to the effective execution of the mission of fighting America's wars and deterring aggression may turn out to be the only viable alternative.

Practically anyone who has experience in the private sector and federal employment knows that the quality of people is comparable. The major difference relates to the fact that bureaucratic organizations are slow to respond to change, whereas corporations in a competitive environment out of necessity are relatively nimble (Katz and Kahn, 1978; Kreitner, 1995). Yet we are living in a world when change is occurring at a faster pace than ever before, and the rate of change is increasing. With

"In the absence of competition, U.S. companies had become bloated and inefficient bureaucracies."

the DoD downsizing, the only practical approach to coping effectively with unpredictable world events is to de-bureaucratize all facets of the DoD.

Successful private sector firms in acutely competitive environments give their customers what they expect. They have little choice, if they wish to exist. The myriad internal units of the DoD and each service branch should also treat each other as valued customers; and customers do not appreciate bureaucratic rigamarole. Since competition is not available to guarantee such treatment, it must be ensured by determined leadership.

Fiscal reality is such that unless large-scale efficiencies are introduced into the DoD, elected officials will be forced to bring about change by the draconian method of cutting the DoD budget. Unfortunately, as experience already demonstrates, this is the method that is most likely to continue reducing the "tooth" much more than the "tail." Only time will tell whether or not the political will and leadership tenacity exist to implement these recommendations.

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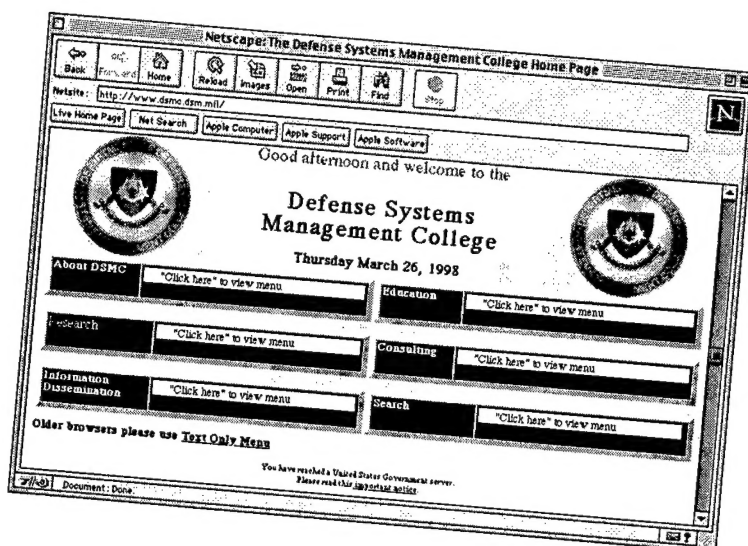
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